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October 16, 2013
Project No.: GF13596

Attention: **Mr. Joseph Chung**
Project Manager

Subject: **Update Geotechnical Report and Preliminary Design Recommendations, County of San Diego Cedar Street and Kettner Boulevard Development Project, Parking Structure, City of San Diego, California**

Gentlemen:

In accordance with your request, presented herein is G- Force's updated geotechnical report and preliminary design recommendations for the proposedCedar and Kettner Parking Structure, aCounty of San Diego Development Project, located in the City of San Diego, California.

The proposed parking structure will be located southwest of the intersection of Cedar Street and Kettner Boulevard and will consist of three subterranean levels and seven elevated levels. It is anticipated that the parking garage will be a reinforced concrete structure supported on a mat slab foundation systemThe recommendations presented herein are based on a review of the Geotechnical Investigation and Geologic Fault Investigation performed for the subject site by Geocon in 2003, available geologic and geotechnical literature, maps pertinent to the proposed construction, the results of our recent subsurface exploration and associated laboratory testing; and our general experience in the area. Included in this report are: 1) engineering characteristics of the onsite soils; 2) discussion of the geologic units onsite; 3) limited geologic hazard analysis; 4)excavation characteristics of earth materials; 5) geotechnical design for the proposed parking structure and associated surface improvements.

G-Force appreciates the opportunity to provide you with geotechnical consulting services and professional opinions. If you have any questions, please contact the undersigned at (619) 583-6633.

Respectfully Submitted,

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UPDATE GEOTECHNICAL REPORT AND PRELIMINARY DESIGN RECOMMENDATIONS
COUNTY OF SAN DIEGO CEDAR AND KETTNER DEVELOPMENT PROJECT
PARKING STRUCTURE
CITY OF SAN DIEGO, CALIFORNIA

1.0 SCOPE OF SERVICES

This study is aimed at providing geotechnical information as it relates to: 1) existing site soil conditions; 2) discussion of the geologic units onsite; 3) limited geologic hazard analysis; 4) engineering characteristics of the onsite soils; 5) excavation characteristics of earth materials; 6) geotechnical design for proposed the proposed subterranean parking structure and the associated surface improvements.

The scope of our study included the following tasks:

- Review of pertinent published and unpublished geologic and geotechnical literature, maps, and aerial photographs.
- Conducting a limited seismicity analysis.
- Prepare a plan depicting the onsite geologic contacts and previous boring locations utilizing a site plan prepared by Nasland Engineering (Plate 1).
- Determine design parameters of onsite soils as a foundation medium including bearing and friction values for foundation soils.
- Determine earth pressures for design of buried structures.
- Develop remedial grading recommendations.
- Preparation of this geotechnical report with exhibits summarizing our findings. This report is suitable for design, contractor bidding, and regulatory review.

2.0 GEOTECHNICAL STUDY LIMITATIONS

The conclusions and recommendations in this report are professional opinions based on the data developed during this study.

The materials immediately adjacent to or beneath those observed may have different characteristics than those observed. No representations are made as to the quality or extent of materials not observed. Any evaluation regarding the presence or absence of hazardous material is beyond the scope of this firm's services.

3.0 SITE LOCATION AND DESCRIPTION

The site for the proposed parking structure is located southwest of the intersection of Cedar Street and Kettner Boulevard in the City of San Diego. The site is bounded to the north by Cedar Street, to the west by California Street, to the east by Kettner Boulevard, and to the south by an existing commercial facility and storage yard. The entrance to the parking structure will be on Kettner Boulevard. The existing buildings to the south of the site will remain during this phase of construction.

The site currently supports an asphalt and concrete paved parking lot. Besides the existing surface improvements, buried gas and sewer utilities are present on site. Site elevations range from approximately 30 feet MSL along the east side to 23 feet MSL along the west side of the site.

4.0 PROPOSED DEVELOPMENT

As G-Force understands the project, the existing parking lot will be demolished and replaced with a ten story parking structure. The parking structure will consist of three subterranean levels and seven above grade levels. As currently designed, basement finish floor elevations are -1.75 MSL on the north side and -6.1 MSL on the south side. Slab subgrade is anticipated to be up to 4 to 6 feet deeper than the finished floor elevation.

5.0 FIELD AND LABORATORY INVESTIGATION

5.1. Previous Studies

5.1.1. Previous Field Investigation

A field investigation was conducted for the subject site by Geocon in July and August of 2003 (Geocon 2003). Five mud rotary borings were drilled to a maximum depth of 91 feet. The boring logs and a description of Geocon's field investigation can be found in Appendix A-2 of this report. Approximate boring locations are shown on the enclosed site map, Plate 1.

Geocon also conducted a Geologic Fault Investigation (Geocon 2003) to address the potential for active faulting on the subject site. Two trenches were excavated in an east-west direction across the property. Based upon their findings it was their conclusion that no active faults are present onsite.

5.1.2. Previous Laboratory Testing

Geocon (2003) laboratory testing consisted of in-place moisture/density, maximum density, shear strength, consolidation, expansion index, chemical, and R-Value tests. Test results are presented herewith in Appendix B-2.

5.2. Current Study

5.2.1. Field Investigation

G-Force conducted a supplemental geotechnical subsurface exploration to further evaluate the soil characteristics onsite. This study consisted of the excavation, logging and sampling of two hollowstem auger borings (HS-1 and HS-2) to a maximum depth of 46.5 below existing grades and the advancement of six Cone Penetrometer Test (CPT) Soundings (CPT-1 thru CPT-6) to a maximum depth of 51.5 feet below existing grade. The approximate location of the borings and CPT soundings are shown on Plate 1. Logs of these borings and CPT soundings are presented in Appendix A-1.

5.2.2. Laboratory Testing

Laboratory testing consisted of in-place moisture and density, shear strength, chemical and resistivity, and consolidation tests. Test results are presented in Appendix B-2.

6.0 ENGINEERING GEOLOGY

6.1. Regional Geologic and Geomorphic Setting

The subject site is situated within the western portion of the Peninsular Ranges Geomorphic Province. The Peninsular Ranges province occupies the southwestern portion of California, extending southward from the Transverse Ranges and Los Angeles Basin to the southern tip of Baja California. In general the province consists of young, steeply sloped, northwest trending mountain ranges underlain by metamorphosed Late Jurassic to Early Cretaceous-aged extrusive volcanic rock and Cretaceous-aged igneous plutonic rock of the Peninsular Ranges Batholith. The westernmost portion of the province is predominantly underlain by younger marine and non-marine sedimentary rocks. The Peninsular Ranges' dominant structural feature is northwest-southeast trending crustal blocks bounded by active faults of the San Andreas transform system.

6.2. Site Geology

A brief description of the earth materials encountered on this site is presented in the following sections. More detailed description of these materials is provided in the boring logs included in Appendix A. An excerpt of the regional geologic map for the San Diego Quadrangle is presented in Figure 1.

6.2.1. Surficial Units

6.2.1.1. Artificial Fill - Undocumented (Qaf)

Undocumented fill was encountered in two of Geocon's borings (in B-2 to a depth of 10 feet and in B-3 to a depth of 4 feet) and in both of their fault trenches. Undocumented fill was encountered our boring HS-1 to a depth of 10 feet. The fill is generally composed of loose to dense, dry to moist, silty to clayey sand with varying amounts of gravel and debris. Some of the soils encountered during our field investigation and Geocon's field investigation had a hydrocarbon odor. Pockets of buried refuse (trash, wood, debris, etc.), in addition to a buried concrete structure containing partially burned wood, ceramic, glass, and ash debris were encountered during the excavation of Geocon's fault Trench 2. A pocket of trash/refuse was encountered in Trench 1 at their approximate stations 40+00 to 50+00. A geophysical study of the site performed in 2012, provided to G Force by the County of San Diego, also indicated anomalies that are consistent with buried concrete structures.

6.2.1.2. Alluvium

Geocon encountered alluvium in both of their fault trenches. This material is generally composed of loose, damp to moist, silty sand. Geocon stated that portions of these deposits may actually be highly weathered Bay Point Formation (now referred to as Old Paralic Deposits).

6.2.1.3. **Old Paralic Deposits (Qop6)**

Late to middle Pleistocene-age Old Paralic Deposits (Unit 6), formerly called Bay Point Formation, was found to underlie the fill and alluvium. The Old Paralic Deposits are relatively dense and consist of silty and clayey sand that is partially cemented in places. Interbeds and lenses of rounded fine to coarse gravel and clay were also observed in the formation. Portions of this formation had a hydrocarbon odor.

6.2.2. **Bedrock Units**

6.2.2.1. **San Diego Formation (Tsd)**

Tertiary-age San Diego Formation was encountered in the borings at depths between 23 and 36 feet. This material was found to be moist to saturated, dense to very dense, silty and clayey sand interbedded with stiff to hard clay, sandy clay, sandy silt, silt, and clay. Interbeds of gravel were also encountered in this formation.

6.2.3. **Groundwater**

Groundwater was encountered by Geocon (Geocon 2003) in all five borings at depths between 27.5 and 34 feet below existing ground surface which correlates to depths of approximately 3 to 6 feet below MSL. Groundwater was encountered in our exploratory borings at depths between 28 and 30 feet below existing ground surface which correlates to depths of approximately 3 to 5 feet below MSL.

Based on the current design, dewatering will be required during construction of the subterranean levels. Dewatering is discussed further in Section 8.4 below.

6.3. **<u>Geologic Hazards</u>**

6.3.1. **Landslides**

Due to the relatively flat nature of the site landsliding is considered remote.

6.3.2. **Flooding, Tsunamis and Seiches**

According to the California Emergency Management Agency (CEMA) tsunami inundation map for emergency planning, Point Loma Quadrange, the subject site is not within a tsunami inundation area.

6.4. **<u>Seismic Hazards</u>**

The site is located in the tectonically active Southern California area, and will therefore likely experience shaking effects from earthquakes. The type and severity of seismic hazards affecting the site are to a large degree dependent upon the distance to the causative fault, the intensity of the seismic event, and the underlying soil characteristics. The seismic hazard may be primary, such as surface rupture and/or ground shaking, or secondary, such as liquefaction or dynamic settlement. The following is a site-specific discussion of ground motion parameters, earthquake-induced landslide hazards, settlement, and liquefaction. The purpose of this analysis is to identify potential seismic hazards and propose mitigations, if necessary, to reduce the hazard to an acceptable level of risk. The following seismic hazards discussion is guided by the California Building Code (2010), CDMG (2008), and Martin and Lew (1998).

6.4.1. **Surface Fault Rupture**

No known active faults have been mapped within the project site. The nearest known active surface fault is the Silver Strand section of the Newport-Inglewood-Rose Canyon fault zone which is approximately ¾ mile west of the project site. It should be noted that the project site is located within the Downtown Special Study Zone (Zone 13) which requires that a fault study be performed. Geocon performed a detailed fault investigation of the project site in 2003 which included the excavation and logging of two fault trenches transecting the site in an east-west direction. It was concluded that there was no evidence of active faulting at the project site.

6.4.2. **Seismicity**

As noted, the site is within the tectonically active southern California area, and is approximately ¾ mile from an active fault, the Silver Strand section of the Newport-Inglewood-Rose Canyon fault zone. The potential exists for strong ground motion that may affect future improvements.

At this point in time, non-critical structures (commercial, residential, and industrial) are usually designed according to the California Building Code (2010) and that of the controlling local agency.

6.4.3. **Liquefaction**

The underlying Old Paralic Deposits (Qop) and the San Diego Formation (Tsd) are not considered to be liquefiable. Accordingly, the potential for liquefaction occurring at this site is unlikely.

6.4.4. **Dynamic Settlement**

Dynamic settlement occurs in response to an earthquake event in loose sandy earth materials. Given the age and the density of the geologic units onsite, and that the proposed foundation will bear on these deposits, the potential of dynamic settlement of the parking structure is considered to be remote.

The proposed surface improvements (concrete, flatwork, pavement, etc.) located outside of the parking garage could undergo dynamic settlement during a significant seismic event.

6.4.5. **Lateral Spread**

Due to the distance of the site from San Diego Bay, the relatively flat grades around the site, and that the structure will be supported on relatively dense formational deposits, the potential for lateral spread into San Diego Bay is considered remote.

7.0 GEOTECHNICAL ENGINEERING

Presented herein is a general discussion of the geotechnical properties of the various soil types and the analytic methods used in this report.

7.1. Soil Characteristics

The materials found in the area of the proposed parking structure consist primarily of silty and clayey sands. Fill containing a fair amount of trash and debris exists onsite at depths up to ten feet. Some of the soils encountered in the borings were found to have a hydrocarbon odor. Interbeds of fine to coarse gravel and clay were observed by Geocon within the Old Paralic Deposits. The deeper San Diego Formation varied from clayey sandstone to silty claystone. Detailed descriptions of these soils and bedrock deposits can be found in the logs of the borings in Appendix A.

7.2. Excavation Characteristics

Based on our previous experience with similar projects near the subject site and the information gathered during our investigation for this report, it is our opinion that the Artificial Fill, Old Paralic Deposits, and San Diego Formation are readily excavatable with conventional trenching equipment. However, portions of the Old Paralic Deposits and San Diego Formation will be below the water table and will likely require dewatering. It should be anticipated that the proposed open cut will require shoring for support of the proposed excavation. Infrequent gravel beds may also be encountered in both the Old Paralic Deposits and the San Diego Formation.

7.3. Groundwater

Groundwater is expected to be encountered at an elevation of approximately 0 to 6 feet below MSL during the excavation for the parking structure. Dewatering should be anticipated. Design of the slab and basement walls should consider uplift forces and hydrostatic pressure. It is recommended that the design groundwater elevation should be 4 MSL.

7.4. Compressibility

Onsite the upper portions of the fill are considered to be moderately compressible in their present condition. Dependent upon the final foundation loading, the Old Paralic Deposits and San Diego Formation could be slightly compressible.

7.5. Earthwork Adjustments

Table 1 summarizes estimated bulk/shrink factors which should be used by the design engineer for earthwork balance estimates. As is the case with every project, contingencies should be made to adjust the earthwork balance when grading is in progress and actual conditions are better defined.

TABLE 1 **Earthwork Adjustment Factors**	
Geologic Unit	**Adjustment Factor**
Undocumented Artificial Fill and Alluvium	Shrink 10%-15%
Old Paralic Deposits and San Diego Formation	Bulk 3%-5%

7.6. Collapse Potential/Hydro-Consolidation

Existing Artificial Fill and Alluvium are considered to be susceptible to collapse/hydro-consolidation. It is anticipated that these materials will be removed during the excavation for the parking structure. However, the surface improvements outside of the proposed shoring will encounter these materials and require mitigation.

7.7. Expansion Potential

Previous laboratory testing conducted by Geocon (2003) indicates that the onsite soils range from “very low” to “high” in expansion potential. The bottom of the structure will be founded in formational materials (Old Paralic Deposits and San Diego Formation) and although this material was tested to be “high” in expansion potential, the anticipated loading and proposed “mat” foundation system will mitigate any adverse effects of expansive soils.

7.8. Shear Strength

Limited shear strength testing was conducted on undisturbed soil samples obtained during Geocon’s 2003 investigation and our recent testing. Based on the testing, blow counts from standard penetration tests (SPT), and our previous experience in the area, G-Force recommends the following shear strength values for the onsite materials.

TABLE 2 **SHEAR STRENGTH**			
Material	**Soil Unit Weight (pcf)**	**Cohesion (psf)**	**Friction Angle (degrees)**
Undocumented Artificial Fill (Qaf) and Alluvium (Qal)	125	50	30
Old Paralic Deposits (Qop6) and San Diego Formation (Tsd) (indicates range of values)	125	350 (180-400)	36 (34-37)

7.9. Resistance Values (R-Values)

One Resistance Value (R-Value) test was conducted by Geocon (2003) with a result of 47. Based on our experience in the area R-Values of the near surface soils are expected to range from 25 to as high as 50.

7.10. Chemical/Resistivity Test Results

Preliminary soluble sulfate and resistivity testing was conducted by Geocon (2003) and G-Force on samples obtained during the investigations. The results of sulfate testing indicate that the soil exhibits "Negligible" sulfate concentrations when classified in accordance with ACI 318-05 Table 4.3.1 (per 2010 CBC). Preliminary resistivity test results range from 630 ohm-cm to 2,025 ohm-cm which indicates that onsite soils may be "Corrosive" to buried metallic construction materials in direct contact with onsite soils. In general, it should be anticipated that concrete mix designs will need to address the potentially corrosive nature of the onsite soils and the portion of the parking structure in contact with native soils. Determination as to the need and specification for protection of metal construction materials should be determined by engineers(s) specializing in corrosion analysis.

7.11. Bearing Capacity and Lateral Earth Pressures

Ultimate bearing capacity values were obtained using the graphs and formulas presented in *NAVFAC DM-7.1*. Allowable bearing was determined by applying a factor of safety of at least three (3) to the ultimate bearing capacity.

Static lateral earth pressures were calculated using *Rankine* methods for active and passive cases. If it is desired to use *Coulomb* forces, a separate analysis specific to the application can be conducted.

8.0 GRADING AND SHORING RECOMMENDATIONS

Based on the information presented herein it is G-Force's opinion that the parking structure, as currently proposed, is feasible from a geotechnical point of view. All grading shall be accomplished under the observation and testing of the project Geotechnical Consultant in accordance with the recommendations contained herein, the current codes practiced by the County of San Diego and this firm's Earthwork Specifications (Appendix C).

8.1. Removals/Overexcavation

Guidelines to determine the depth of removals are presented below; however, the exact extent of the removals must be determined in the field during grading, when observation and evaluation of greater detail afforded by those exposures can be performed by the Geotechnical Consultant. Unsuitable soils removal criteria are dependent upon the consolidation characteristics, the calculated degree of saturation (S), and the relative density of the in-situ soils.

Existing flatwork, vegetation, trash, debris, and other deleterious materials should be removed and wasted from the site prior to commencing removal of unsuitable soils and placement of compacted fill materials.

Undocumented Artificial Fill (map symbol Qaf), and Alluvium (map symbol Qal) will require complete removal within the building footprint. The structure should be founded on competent Old Paralic Deposits (map symbol Qop_6) (formerly called Bay Point Formation) and/or San Diego Formation. If soft and or settlement sensitive soils/bedrock are exposed at the bottom of the proposed foundations they should be overexcavated until competent materials are exposed. The overexcavated area can be brought back up to design subgrade with a lean sand/cement mixture.

For improvements outside of the structural footprint of the garage, minimally the upper 18-36 inches of soils will require removal and recompaction where they will support settlement sensitive surface improvements (driveway, concrete flatwork, etc.). If refuse/trash is encountered, complete removal of these materials and replacement with suitable low expansive soils is required.

8.2. Earthwork Considerations

8.2.1. Compaction Standards

All fills should be compacted to a minimum of 90 percent of the maximum dry density as determined by ASTM D1557. All loose and or deleterious soils should be removed to expose firm native soils or formational soils. Prior to the placement of fill, the upper 6 to 8 inches should be ripped, moisture conditioned to optimum moisture or slightly above optimum, and compacted to a minimum of 90 percent of the maximum dry density (ASTM D1557). Fill should be placed in thin (6 to 8-inch) lifts, moisture conditioned to optimum moisture or slightly above, and compacted to 90 percent of the maximum dry density (ASTM D1557) until the desired grade is achieved.

For driveway areas and other flatwork subjected to vehicular loading, a minimum compaction standard of 95 percent of the laboratory maximum dry density should be used within the upper 12 inches.

8.2.2. **Mixing and Moisture Control**

In order to prevent layering of different soil types and/or different moisture contents, mixing and moisture control of materials will be necessary. The preparation of the earth materials through mixing and moisture control should be accomplished prior to and as part of the compaction of each fill lift. Water trucks or other water delivery means may be necessary for moisture control. Discing may be required when either excessively dry or wet materials are encountered.

8.2.3. **Compaction Equipment**

Compaction equipment on the project shall include a combination of rubber-tired and sheepsfoot rollers to achieve proper compaction. Adequate water trucks/pulls should be available to provide sufficient moisture and dust control.

8.3. Excavation and Temporary Cut Slopes

All excavations should be shored or laid back in accordance with applicable Cal-OSHA standards. The subterranean parking structure will be founded on formational materials (Old Paralic Deposits and San Diego Formation) which can be considered a Type "A" soil. Fill and Alluvium can be considered Type "B" soil. Any temporary excavation greater than 5 feet in height should be laid back with a 3/4:1 (horizontal: vertical) gradient in competent formational material or 1:1 in fill/alluvial soils. These excavations should not become saturated or allowed to dry out. Surcharge loads should not be permitted within a distance equal to the height of the excavation from the top of the excavation. The top of the excavation should be a minimum of 15 feet from the edge of existing improvements. Excavations steeper than those recommended or closer than 15 feet from an existing surface improvement should be temporarily shored in accordance with applicable OSHA codes and regulations. Soil parameters for shoring and tieback design are presented in Section 8.5 below.

8.4. Dewatering

It is anticipated that dewatering will be necessary to construct the proposed subterranean parking structure. Dewatering can create subsidence outside of the area of work and distress to adjacent improvements. It is suggested that adjacent improvements be inventoried prior to dewatering and observed periodically to determine if the dewatering is creating settlement outside of the work area. It is also suggested that key survey points (see section 8.6) should be established and monitored during construction and dewatering.

Discharge of groundwater generated during the dewatering process will require a discharge permit in accordance with NPDES permits. Accordingly, water testing and possible treatment of the water will likely be necessary.

8.5. Shoring and Tieback Design

8.5.1. **Shoring and Tieback Design**

Shoring and/or tiebacks will be necessary for the excavation for the parking structure. In general, soldier piles with wood lagging and sheet piling can be used for support of the temporary excavations. Temporary tied-back shoring should be designed using a lateral pressure envelope acting uniformly on the back of the shoring and applying a pressure equal to 20H, where H is the height of the shoring in feet (resulting pressure in pounds per square foot).The design of shoring should consider hydrostatic pressures, adjacent structures and transient traffic and construction loads. For transitory loads caused by the adjacent rail lines it is G-Force's recommendation that SCRRA Excavation and Support Guidelines are utilized (SCRRA July 2009).

Passive soil pressure resistance for the embedded portions of soldier piles can be designed utilizing a triangular pressure distribution with an equivalent passive soil fluid weight of 442D, where D is the depth of embedment in feet (resulting in pounds per square foot), as shown in Figure 2. The passive resistance can be assumed to act over a width of three pile diameters. We recommend that cantilevered soldier piles without tiebacks be embedded a minimum of 0.5 times the maximum height of the excavation (this depth is to include footing excavations). The project structural engineer should determine the actual embedment depth.

Tiebacks, if used, should develop resistance past the active pressure zone behind the wall (28 degree angle projected from the toe of the wall). Anchor capacity is dependent upon the installation techniques used by the contractor and is typically a design-build from the specialty contractor. A factor of safety of 2.5 to 3 is common for the design of a tieback system. Soil shear strength and cohesion parameters for design of the temporary shoring are presented in Table 2 – Section 7.8.

A tieback testing program should be undertaken during installation to verify the maximum and design capacity of the tiebacks. Anchors should be proof tested to a minimum of 150 percent of the design working load.

8.6. Monitoring of Settlement and Lateral Movement

Deep excavations, shoring and tie-back walls adjacent to existing improvements can cause settlement and disturbance to existing adjacent improvements. It is recommended that survey monuments should be installed within a 1½:1 projection of the bottom of any vertical cut, at the top of the soldier pile/sheet pile, midpoint and bottom of the pile at the base of the excavation. These monitoring points should be monitored on a regular basis during construction to within a tolerance of ¼ inch. Prior to construction a detailed inventory of all adjacent surface and subsurface improvements should be made. Regularly scheduled survey should be conducted around all deeper excavations. If movement is noted then corrective actions can be instigated.

9.0 CONCLUSIONS AND RECOMMENDATIONS

Construction of the proposed parking structure is considered feasible, from a geotechnical standpoint, provided that the conclusions and recommendations presented herein are incorporated into the design and construction of the project. As with all projects, changes in observed conditions may result in alternative construction techniques and/or possible delays. The contractor should be aware of these possibilities and provide contingencies in his bids to account for them.

9.1. Foundation Design – Parking Structure

The proposed subterranean parking structure can be supported on conventional spread footings or a mat foundation system. The design of foundation systems should be based on the following values, assuming the structural elements will be founded on competent formational materials.

Allowable Bearing: **Continuous & Spread Footings**: 6,000 psf- for 12 inch base width (continuous) and 24 inch (spread) with a minimum depth of 18 inches below lowest adjacent grade. 800 psf per each additional foot of depth, and 400 psf for each additional foot of width, to a maximum of 9,000 psf

Mat Foundation: 9,000 psf founded on dense formational materials. A modulus of subgrade reaction (k) of 175 pci can be used for mat design, where $K = k((b+1)/(2b))^2$ and b = least width of the foundation

Sliding Coefficient: 0.40 (between soil and concrete)

Settlement: Total = ¾ inch
Differential = ½ inch in 20 feet

The frictional and passive resistance of the soil may be combined without reduction. The above values may be increased by 1/3 as allowed by Code to resist transient loads. Building Code and structural design considerations may govern.

9.2. Foundation Design –Ancillary Structures

The proposed ancillary structures/walls outside of the parking structure can be supported on conventional spread footings. The design of foundation systems should be based on the following values, assuming the structural elements will be founded on competent formational materials.

Allowable Bearing: 2500 psf (assuming a minimum width of 12 inches and embedment depth of 12 inches below lowest adjacent grade)

Lateral Bearing: 250 lbs./sq.ft. at a depth of 12 inches plus
125 lbs./sq.ft. for each additional 12 inches
embedment to a maximum of 2000 lbs./sq.ft.

Sliding Coefficient: 0.40 (between soil and concrete)

Settlement: Total = 3/4 inch

Differential: 3/8 inch in 20 feet

The above values may be increased by 1/3 as allowed by Code to resist transient loads. Building Code and structural design considerations may govern.

9.3. Earth Pressures for Design of Buried Structures

The recommended active, passive and at rest earth Rankine earth pressures, which may be utilized for design of permanent buried structures with level backfill are as follows:

Table 9.3

Earth Pressures for Retaining walls

Static Case Level Backfill	Rankine Coefficients	Equivalent Fluid Pressure (psf/lin.ft.)	Equivalent Fluid (Saturated) Pressure (psf/lin.ft.)
Coefficient of Active Pressure:	$K_a = 0.28$	35	18
Coefficient of Passive Pressure:	$K_p = 3.54$	442	221
Coefficient of at Rest Pressure:	$K_o = 0.44$	55	28

9.3.1. Restrained Basement Walls

For rigid restrained walls like the proposed subterranean basement walls it is recommended that an "At-Rest" value utilizing a triangular pressure distribution should be used for the design. When below the design groundwater table (4.0 MSL), the buoyant unit weight of soil should be used.

For basement walls below the design groundwater table (4.0 MSL) additional hydrostatic pressures should be included. Hydrostatic loading can be modeled as a triangular pressure distribution equaling the 62.4 psf times the depth below the design water level.

For restrained basement walls subject to seismic loading an additional seismic pressure distribution equaling 11H psf (where H = retained height in feet) applied as an uniform pressure on the restrained walls. The resultant of the seismic pressure should be at H/2 (50% of the wall height).

Additional traffic loads and rail loads should be considered in the design. For temporary traffic loads an equivalent fluid pressure of 75 psf can be used. For rail loads it is recommended that SCRRA Excavation Support Guidelines (July 2009) should be used.

The frictional and passive resistance of the soil may be combined without reduction.

Figure 3 presents lateral earth pressure distributions for the restrained subterranean walls.

9.3.2. Ancillary Retaining Walls

For the ancillary retaining walls which are considered un-restrained, active and passive pressures can be used for the design. In addition to the above static pressures, ancillary unrestrained retaining walls located outside of the subterranean garage should be designed to resist seismic loading as required by the 2010 CBC. The seismic load can be modeled as a thrust load applied at a point 0.6H above the base of the wall, where H is equal to the height of the wall. This seismic load (in pounds per lineal foot of wall) is represented by the following equation:

$$Pe = \tfrac{3}{8} * \gamma * H^2 * k_h$$

Where:

Where:	Pe	=	Seismic thrust load
	H	=	Height of the wall (feet)
	γ	=	soil density = 125 pounds per cubic foot (pcf)
	k_h	=	seismic pseudostatic coefficient = 0.5 * peak horizontal ground acceleration / g

The peak horizontal ground accelerations are provided in Section 9.4. Walls should be designed to resist the combined effects of static pressures and the above seismic thrust load.

Retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic pressures. Otherwise, the retaining walls should be designed to resist hydrostatic forces. Proper drainage devices should be installed along the top of the wall backfill and should be properly sloped to prevent surface water ponding adjacent to the wall. In addition to the wall drainage system, for building perimeter walls extending below the finished grade, the wall should be waterproofed and/or damp-proofed to effectively seal the wall from moisture infiltration through the wall section to the interior wall face.

The wall should be backfilled with granular soils placed in loose lifts no greater than 8-inches thick, at or near optimum moisture content, and mechanically compacted to a minimum 90 percent of the maximum dry density as determined by ASTM D1557-09. Flooding or jetting of backfill materials generally do not result in the required degree and uniformity of compaction and, therefore, is not recommended. No backfill should be placed against concrete until minimum design strengths are achieved as verified by compression tests of cylinders. The geotechnical consultant should observe the retaining wall footings, back drain installation, and be present during placement of the wall backfill to confirm that the walls are properly backfilled and compacted.

9.4. Seismic Design Parameters

The following seismic design parameters are presented to be code compliant to the California Building Code (2010). The subject water line project is considered to be site class "C" in accordance with CBC, 2010, Table 1613.5.3 (1). The site is located at Latitude 32.7217˚ N and Longitude -117.1696˚ W. Utilizing this information, the computer program USGS Earthquake Ground Motion Parameters Version 5.1.0 and ASCE 7 criterion, the seismic design category for 0.2 seconds (S_S) and 1.0 second (S_1) period response accelerations can be determined (CBC, 2010 1613.5.5.1) along with the design spectral response acceleration (CBC, 2010 1613.5.4).

Seismic Design Criteria	
Mapped Spectral Acceleration (0.2 sec Period), S_S	1.569g
Mapped Spectral Acceleration (1.0 sec Period), S_1	0.614g
Site Coefficient, F_a	1.00
Site Coefficient, F_v	1.30
MCE Spectral Response Acceleration (0.2 sec Period), SM_S	1.569g
MCE Spectral Response Acceleration (1.0 sec Period), SM_1	0.798g
Design Spectral Response Acceleration (0.2 sec Period), SD_S	1.046g
Design Spectral Response Acceleration (1.0 sec Period), SD_1	0.532g

9.5. **Preliminary Pavement Design**

For concrete paving the following pavement sections are presented assuming a modulus of subgrade reaction k=200pci and a modulus of rupture (MR) for the concrete of 550psi:

Location	**Traffic Index**	**Recommended Section**
Parking	5.0	6 inches Concrete over 4-inches Aggregate Base*
Driveway	6.0	6 inches AC over 4-inches Aggregate Base*

*Compacted to a minimum of 95% (per ASTM D1557)

Consideration should be given to a thickened edge where the pavement transitions from asphaltic concrete to concrete. To minimize unwanted cracking control joints should be placed at 10 foot centers both ways.

9.6. **Plan Review**

Once final design plans become available, they should be reviewed by G-Force to verify that the design recommendations presented are consistent with the proposed construction.

9.7. **Geotechnical Review**

As is the case in any grading project, multiple working hypotheses are established utilizing the available data, and the most probable model is used for the analysis. Information collected during the grading and construction operations is intended to evaluate the hypotheses, and some of the assumptions summarized herein may need to be changed as more information becomes available.

Some modification of the grading and construction recommendations may become necessary, should the conditions encountered in the field differ significantly than those hypothesized to exist.

G-Force should review the pertinent plans and sections of the project specifications, to evaluate conformance with the intent of the recommendations contained in this report.

If the project description or final design varies from that described in this report, G-Force must be consulted regarding the applicability of, and the necessity for, any revisions to the recommendations presented herein. G-Force accepts no liability for any use of its recommendations if the project description or final design varies and G-Force is not consulted regarding the changes.

10.0 LIMITATIONS

This report is based on the project as described and the information obtained from the investigations performed by Geocon (2003) and G-Force (2013). The findings are based on the results of the field, laboratory, and office investigations combined with an interpolation and extrapolation of conditions between and beyond the excavation locations. The results reflect an interpretation of the direct evidence obtained. Services performed by G-Force have been conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. No other representation, either expressed or implied, and no warranty or guarantee is included or intended.

The recommendations presented in this report are based on the assumption that an appropriate level of field review will be provided by geotechnical engineers and engineering geologists who are familiar with the design and site geologic conditions. That field review shall be sufficient to confirm that geotechnical and geologic conditions exposed during grading are consistent with the geologic representations and corresponding recommendations presented in this report. G-Force should be notified of any pertinent changes in the project plans or if subsurface conditions are found to vary from those described herein. Such changes or variations may require a re-evaluation of the recommendations contained in this report.

The data, opinions, and recommendations of this report are applicable to the specific design of this project as discussed in this report. They have no applicability to any other project or to any other location, and any and all subsequent users accept any and all liability resulting from any use or reuse of the data, opinions, and recommendations without the prior written consent of G-Force.

G-Force has no responsibility for construction means, methods, techniques, sequences, or procedures, or for safety precautions or programs in connection with the construction, for the acts or omissions of the CONTRACTOR, or any other person performing any of the construction, or for the failure of any of them to carry out the construction in accordance with the final design drawings and specifications.

REFERENCES

California Building Standards Commission, 2010, *California Building Code*, Title 24, Part 2, Volumes 1 and 2.

California Emergency Management Agency, 2009, Tsunami Innundation Map for Emergency Planning, State of California, County of San Diego, Point Loma Quadrangle, June 1, 2009, Scale 1:24,000.

California Geological Survey, 2003, State of California, Earthquake Fault Zones, Point Loma Quadrangle, Revised Official Map, Effective Date May 1, 2003, Scale 1:24,000.

City of San Diego, 2008, Seismic Safety Study, Geologic Hazards and Faults, Grid Tile 17, dated April 3, 2008, Scale 1" = 800'.

Geocon, 2003, *Geotechnical Investigation and Geologic Fault Investigation, Cedar/Kettner Parking/Residential Structure, San Diego, California,* dated 10/14/2003, Project No. 06851-22-02.

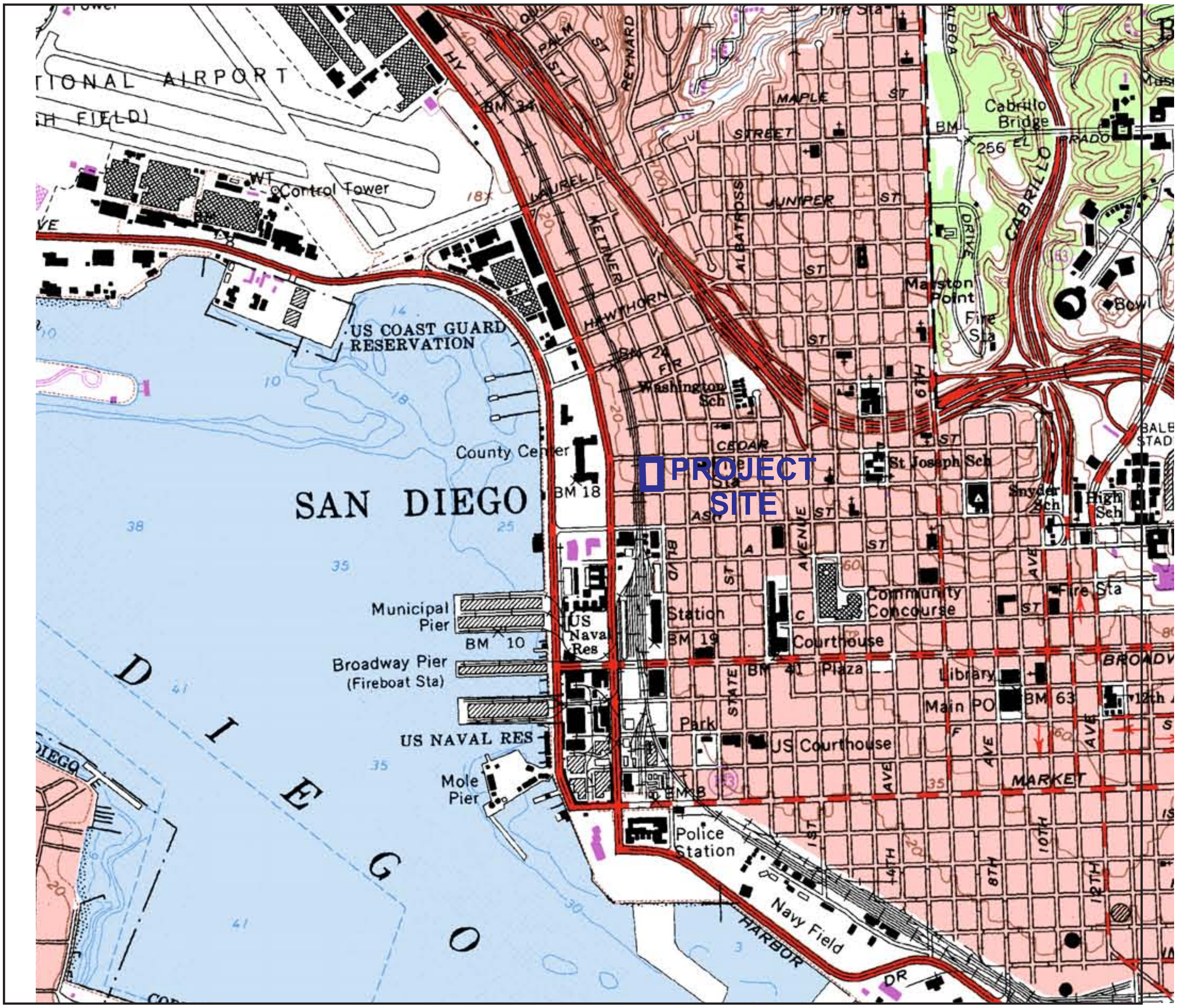
Jennings, C.W., 1994, Fault Activity Map of California and Adjacent Areas: California Geological Survey, California Geologic Data Map No. 6, Scale 1:750,000.

Kennedy, M.P., 1975, Geology of the Point Loma Quadrangle, San Diego County, California, California Geological Survey, Bulletin 200, Scale 1:24,000

Kennedy, M.P., and Tan, S.S., 2008, Geologic Map of the San Diego 30' x 60' Quadrangle, California Regional Geologic Map Series, Scale 1:100,000, Map No. 3, Sheet 1 of 2.

Tan, S.S., 1995, Landslide Hazards in the Southern Part of the San Diego Metropolitan Area, San Diego County, California, Landslide Hazard Identification Map No. 33, Plate 33A, Division of Mines and Geology, Open File Report 95-03.

United States Geological Survey, 2010 Ground Motion Parameter Calculator v. 5.1.0., World Wide Web, http://earthquake.usgs.gov/research/hazmaps/design/.



N

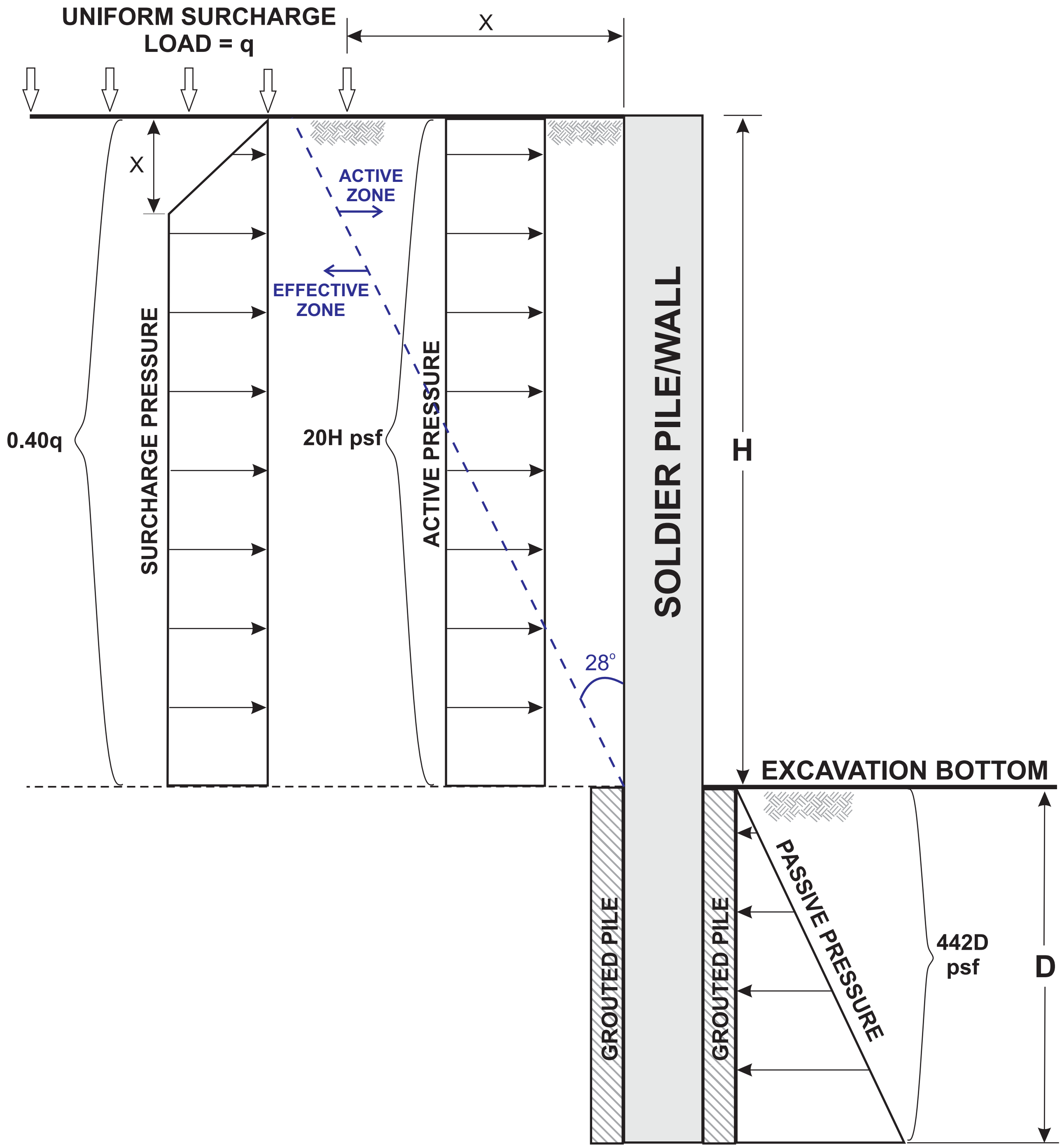
SITE LOCATION MAP

SAN DIEGO COUNTY
PARKING STRUCTURE
CEDAR STREET & KETTNER BOULEVARD
SAN DIEGO, CALIFORNIA

SOURCE MAP - TOPOGRAPHIC MAP OF THE
POINT LOMA 7.5 MINUTE QUADRANGLE,
SAN DIEGO COUNTY, CALIFORNIA

4035 Pacific Highway
San Diego, California 92110
Telephone: (619) 583-6633

FIGURE 1



NOTE: EFFECTIVE ZONE FOR TIEBACK ANCHORS BEGINS AT A 28 DEGREE VERTICAL PROJECTION FROM BACK OF SOLDIER PILE/WALL FACE

VER 1.0

NTS

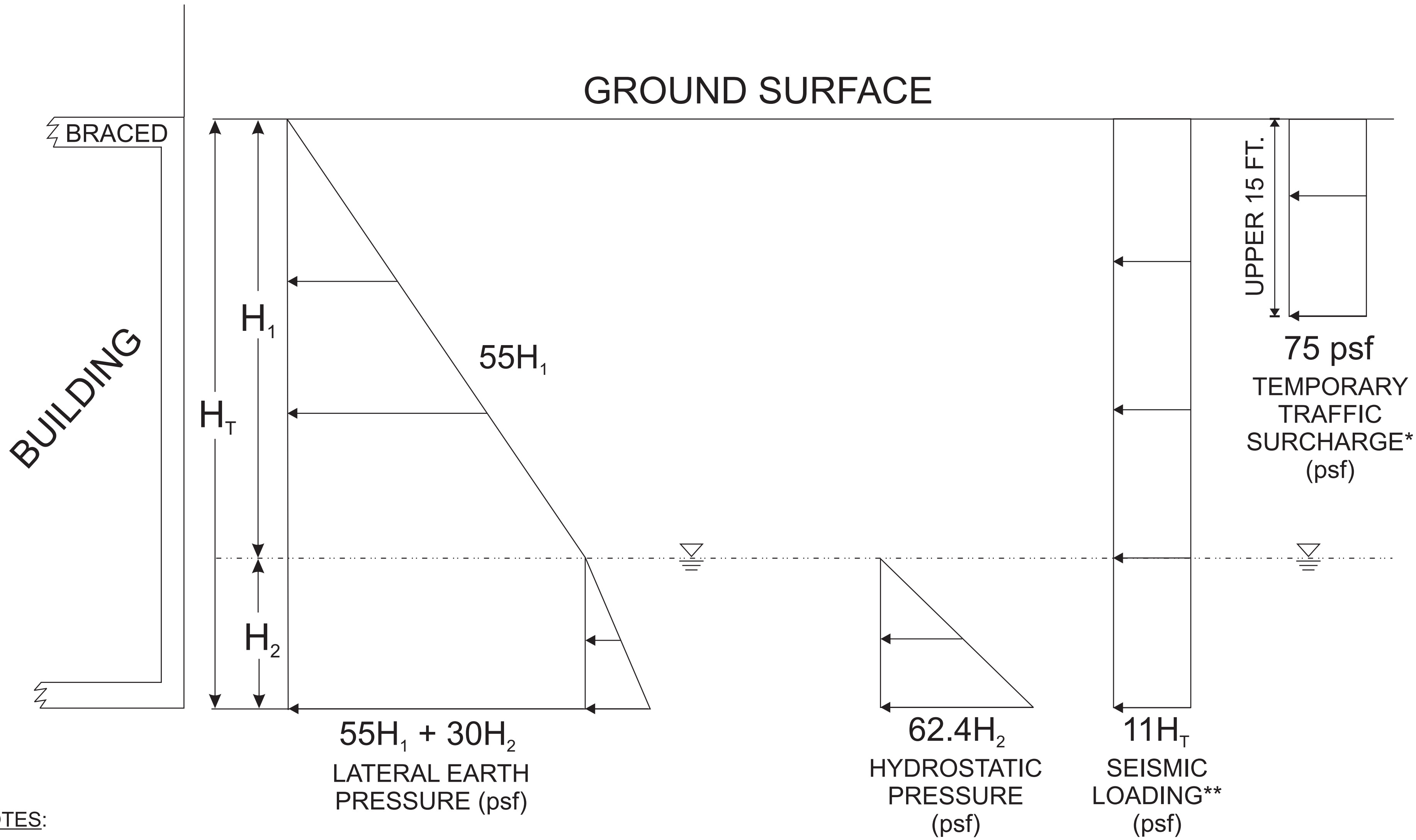
G FORCE®

CEDAR & KETTNER PARKING STRUCTURE

PROJECT NO. GF13596

SOLDIER PILE/WALL PRESSURE DISTRIBUTION DIAGRAM

FIGURE 2



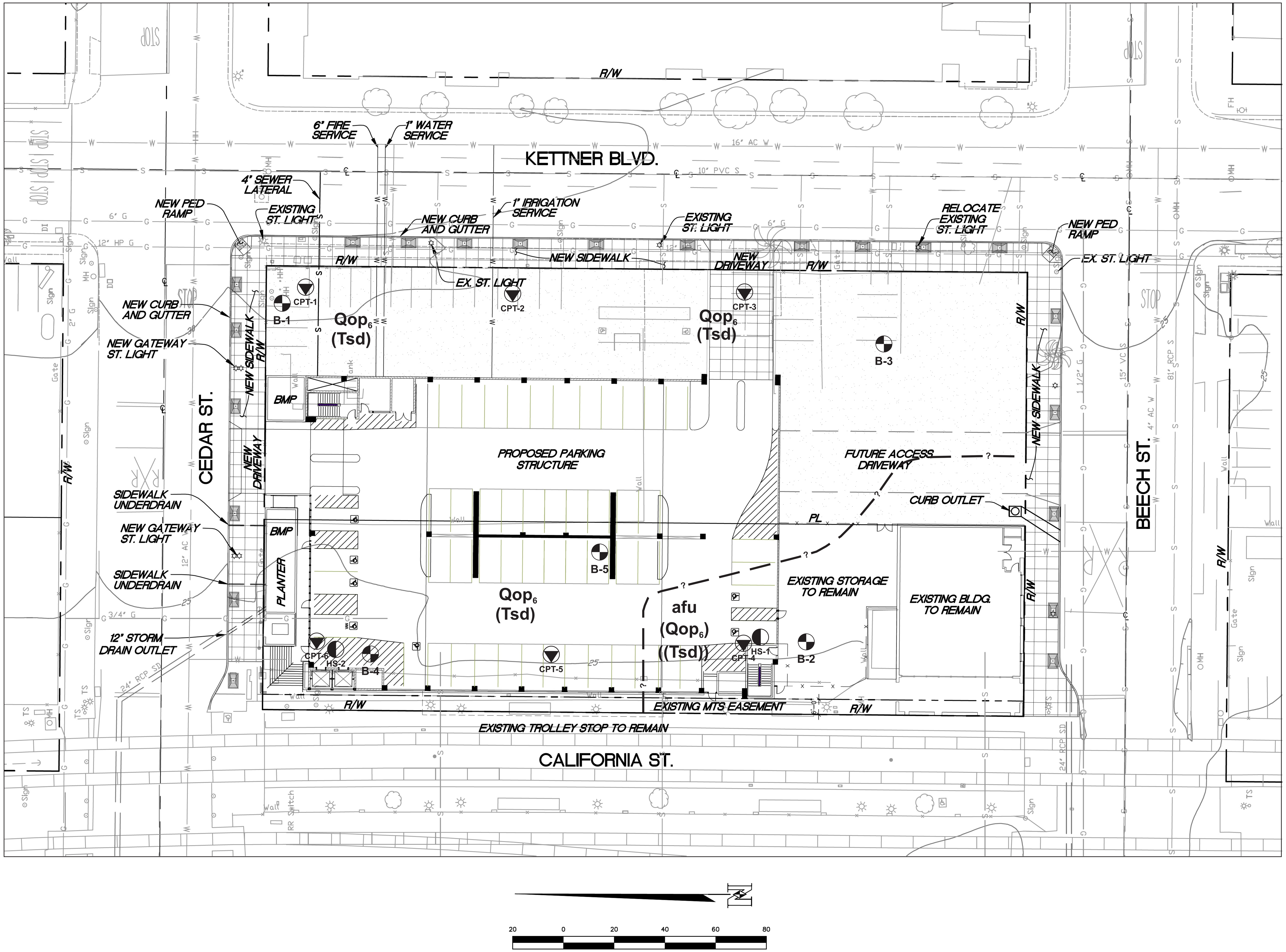
NOTES:

* FOR PERMANENT/SHORING LOADS SUBJECT TO RAILROAD LOADING, ADDITIONAL LOADING TO BASEMENT WALLS SHOULD BE CONSIDERED IN CONFORMANCE TO SCRRA EXCAVATION SUPPORT GUIDELINES (JULY 2009)

** RESULTANT ACTING AT $H_T/2$

NTS

CEDAR & KETTNER PARKING STRUCTURE PROJECT NO. GF13596	RESTRAINED BASEMENT WALL PRESSURE DISTRIBUTION DIAGRAM	FIGURE 3 VER 1.0



LEGEND

- HS-2 — Approximate Location of Exploratory Boring (G Force, 2013)
- CPT-6 — Approximate Location of CPT Sounding (G Force, 2013)
- B-5 — Approximate Location of Exploratory Boring (Geocon, 2003)
- afu — Artificial Fill - Undocumented
- Qop_6 — Old Paralic Deposits (Bracketed where buried)
- Tsd — San Diego Formation (Bracketed where buried)
- Geologic Contact (Queried where uncertain)

PLATE 1

Geologic Map and Boring Location Plan

G FORCE®

CEDAR STREET AND KETTNER BOULEVARD PARKING STRUCTURE

COUNTY OF SAN DIEGO

PROJECT NO. GF13596

APPENDIX A

FIELD DATA

APPENDIX A-1

FIELD DATA

G-Force

4035 Pacific Highway
San Diego, California 92110
(619) 583-6633

BORING NUMBER HS-1

CLIENT McCarthy Building Companies, Inc.
PROJECT NAME Cedar and Kettner Parking Structure
PROJECT NUMBER 13596
PROJECT LOCATION San Diego, CA
DATE STARTED 9/21/13 **COMPLETED** 9/21/13
GROUND ELEVATION 25 ft **HOLE SIZE** 8"
DRILLING CONTRACTOR Baja Exploration
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING 30.00 ft / Elev -5.00 ft
LOGGED BY JEH **CHECKED BY** PJD
AT END OF DRILLING 29.50 ft / Elev -4.50 ft
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		SM	**ARTIFICIAL FILL - UNDOCUMENTED** (afu): SILTY SAND, dark gray, moist, loose; strong gas odor.										
5				SPT	4-7-7 (14)								
10		SM	**OLD PARALIC DEPOSITS** (Qop6): SILTY SAND, mottled gray and brown, moist, moderately dense; with gravel, gas odor.	MC	6-9-11 (20)								
15			@ 15.0 ft. some angular to subrounded gravel to 1.5", gas odor.	SPT	5-4-4 (8)								
20			@ 20.0 ft. green gray; some subrounded gravel, gas odor.	MC	8-8-8 (16)	110	13.4						
				BU									
25		SP	**SAN DIEGO FORMATION** (Tsd): SAND, fine-grained, gray green, moist, very dense; gas odor.	MC	19-50								
30			@ 30.0 ft. brown, wet; no gas odor, micaceous.	MC	22-50								
35													

(Continued Next Page)

4035 Pacific Highway
San Diego, California 92110
(619) 583-6633

BORING NUMBER HS-1

CLIENT McCarthy Building Companies, Inc.
PROJECT NAME Cedar and Kettner Parking Structure
PROJECT NUMBER 13596
PROJECT LOCATION San Diego, CA

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
35			**SAN DIEGO FORMATION** (Tsd): SAND, fine-grained, gray green, moist, very dense; gas odor. *(continued)* @ 35.0 ft. green gray brown, dense; some coarse-grained sand, rare gravel to 1/2", micaceous.	MC	24-32-50 (82)								
40			@ 40.0 ft. fine- to coarse-grained, saturated, medium dense; no gravel, micaceous.	MC	6-11-30 (41)								
45		SM	@ 45.0 ft. SILTY SAND, fine-grained, gray brown, wet, moderately dense; minor iron oxide development, trace clay, micaceous.	MC	5-6-10 (16)	98	28.3						

Total Depth = 46.5 Feet
Groundwater @ 30.0 Feet
Backfilled with Bentonite Grout

4035 Pacific Highway
San Diego, California 92110
(619) 583-6633

BORING NUMBER HS-2

CLIENT McCarthy Building Companies, Inc.
PROJECT NAME Cedar and Kettner Parking Structure
PROJECT NUMBER 13596
PROJECT LOCATION San Diego, CA
DATE STARTED 9/21/13 **COMPLETED** 9/21/13
GROUND ELEVATION 24 ft **HOLE SIZE** 8"
DRILLING CONTRACTOR Baja Exploration
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING 29.50 ft / Elev -5.50 ft
LOGGED BY JEH **CHECKED BY** PJD
AT END OF DRILLING 29.00 ft / Elev -5.00 ft
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		SM	**OLD PARALIC DEPOSITS**(Qop6): SILTY SAND, fine- to medium-grained, reddish brown, slightly moist, moderately dense; no gas odor.										
5			@ 5.0 ft. medium dense.	SPT	12-11-12 (23)								
10			@ 10.0 ft. fine- to coarse-grained, red-orange brown, very dense.	SPT	18-21-15 (36)								
15		SP	@ 15.0 ft. SAND, fine- to coarse-grained, orange brown, moist to wet, very dense.	MC	16-32-50 (82)								
20			@ 20.0 ft. fine- to medium-grained, wet to saturated; micaceous, trace clay.	BU SPT	4-14-15 (29)								
25			@ 25.0 ft. medium-grained, saturated; micaceous, slightly silty.	MC	28-50								
30			@ 30.0 ft. dense.	MC	19-29-27 (56)								
35		ML											

(Continued Next Page)

4035 Pacific Highway
San Diego, California 92110
(619) 583-6633

BORING NUMBER HS-2

CLIENT McCarthy Building Companies, Inc.
PROJECT NAME Cedar and Kettner Parking Structure
PROJECT NUMBER 13596
PROJECT LOCATION San Diego, CA

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
35			**SAN DIEGO FORMATION** (Tsd): SANDY SILT, mottled olive gray and orange, wet, medium dense; sand portion is fine-grained, micaceous, some iron oxide development. *(continued)*	MC	11-16-17 (33)								
40			@ 40.0 ft. olive gray, saturated; micaceous, rare iron oxide development.	MC	7-12-15 (27)	106	22.4						

Total Depth = 41.5 Feet
Groundwater @ 30.0 Feet
Backfilled with Bentonite Grout

G-Force

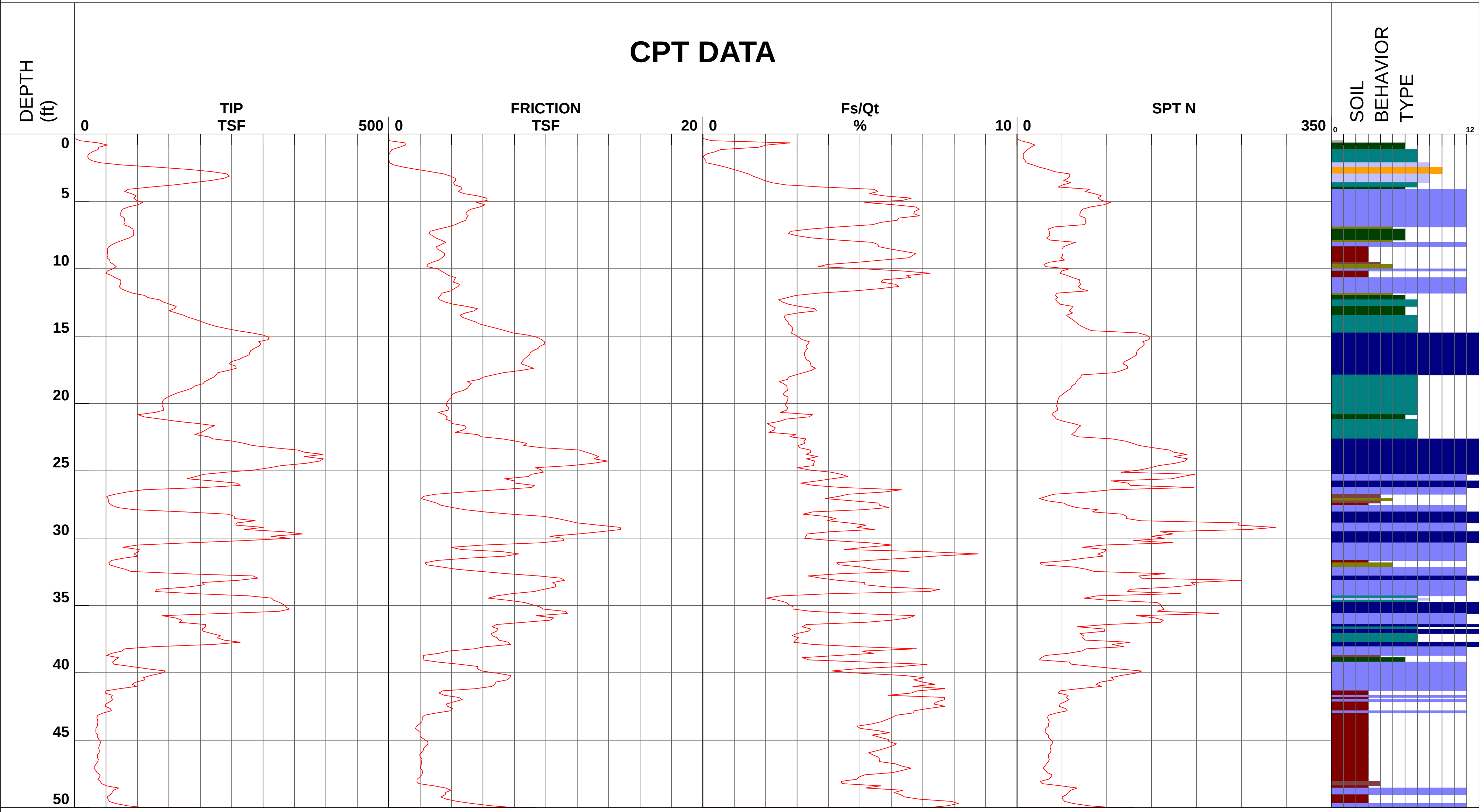
Project Cedar and Kettner Blvd Parking Structur
Job Number GF13596
Hole Number CPT-01
EST GW Depth During Test 30.00 ft

Operator SA-BH
Cone Number DSG1104
Date and Time 9/21/2013 8:31:06 AM

Filename SDF(106).cpt
GPS
Maximum Depth 50.52 ft

Net Area Ratio .8

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

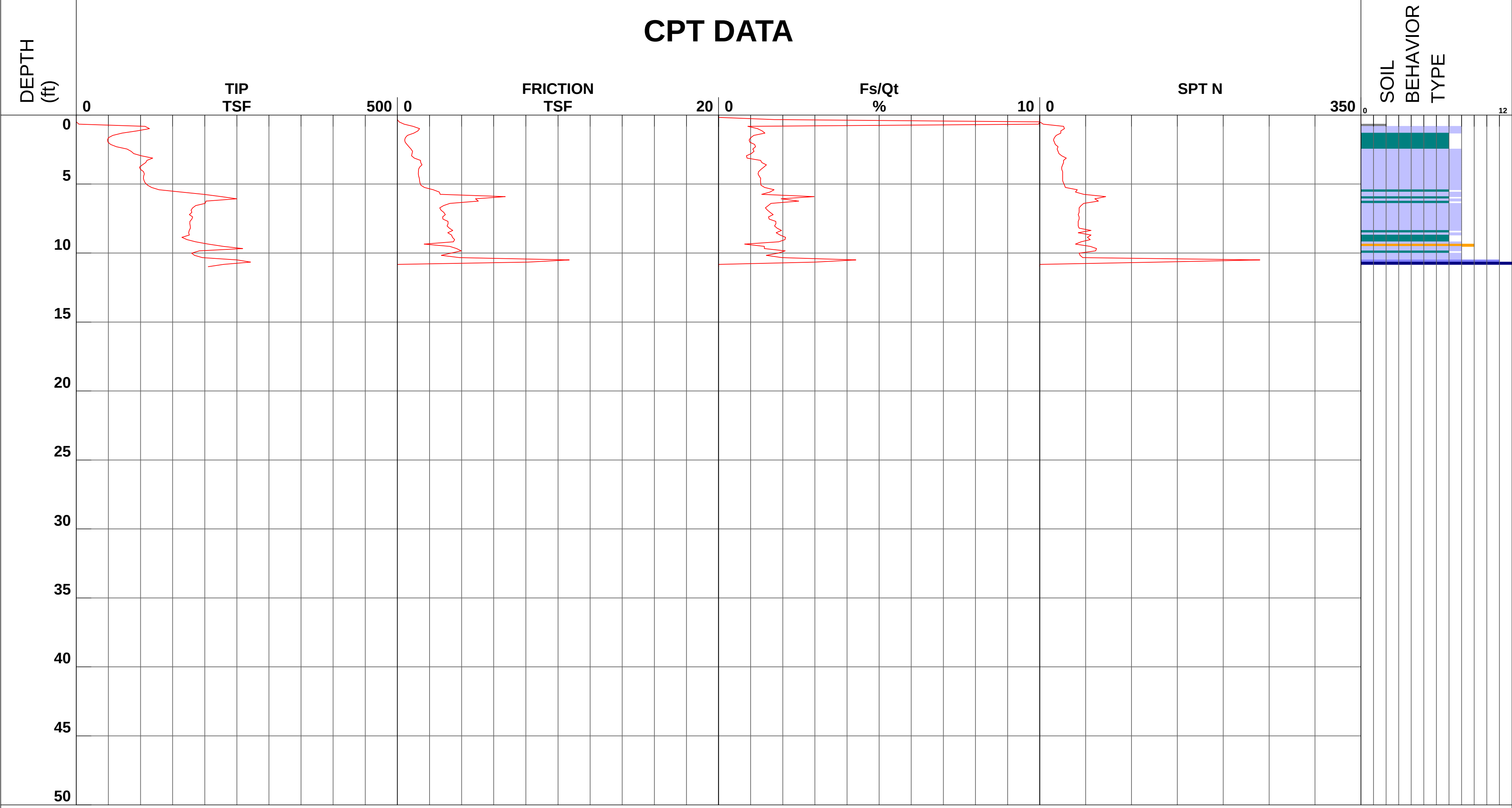
Cone Size 10cm squared

S*Soil behavior type and SPT based on data from UBC-1983

G-Force

Project	Cedar and Kettner Blvd Parking Structur	Operator	SA-BH	Filename	SDF(105).cpt
Job Number	GF13596	Cone Number	DSG1104	GPS	
Hole Number	CPT-02	Date and Time	9/21/2013 7:59:51 AM	Maximum Depth	10.99 ft
EST GW Depth During Test			30.00 ft		

Net Area Ratio .8



- 1 - sensitive fine grained
- 2 - organic material
- 3 - clay
- 4 - silty clay to clay
- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty sand to sandy silt
- 8 - sand to silty sand
- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)

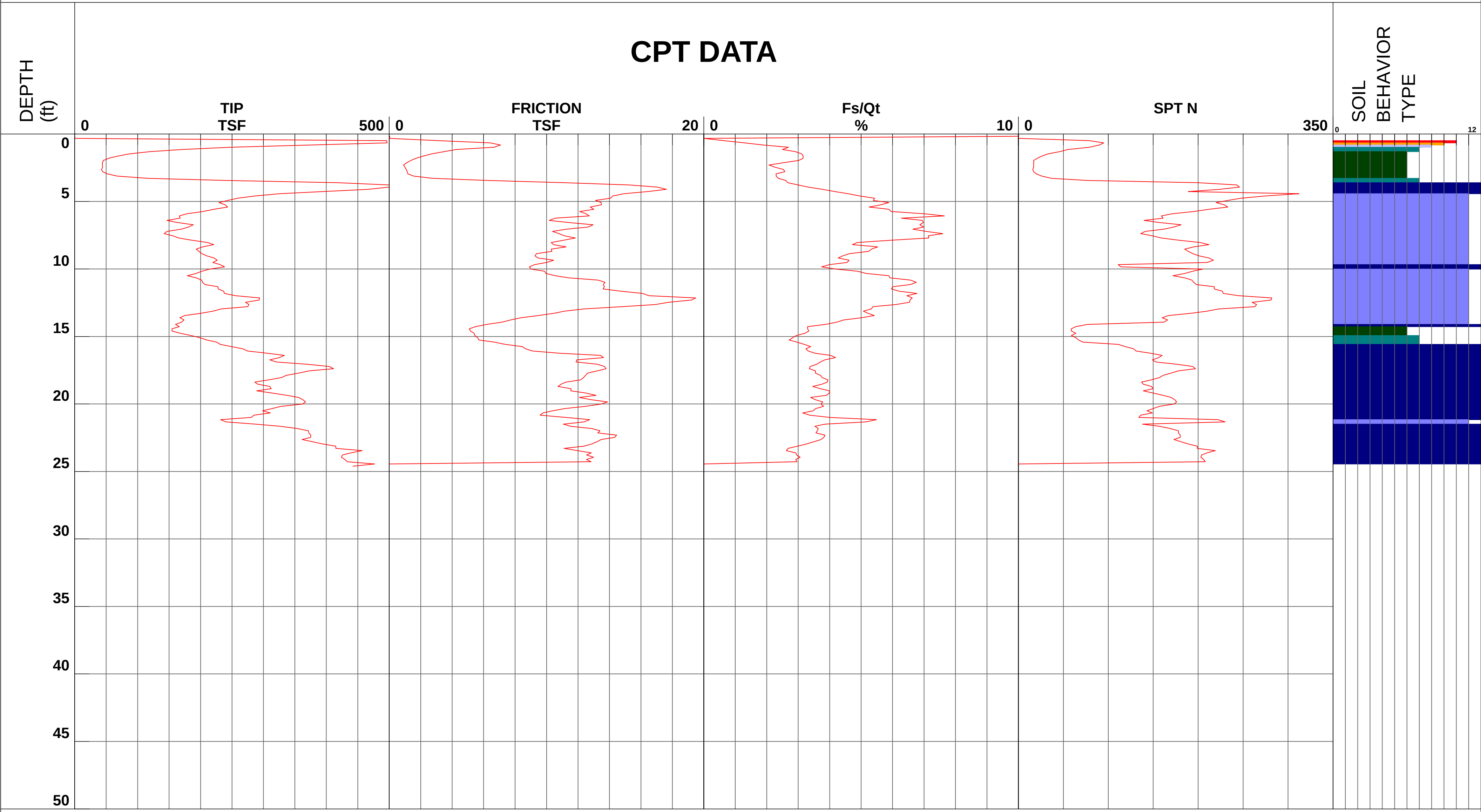
Cone Size 10cm squared

S*Soil behavior type and SPT based on data from UBC-1983

G-Force

Project	Cedar and Kettner Blvd Parking Structur	Operator	SA-BH	Filename	SDF(107).cpt
Job Number	GF13596	Cone Number	DSG1104	GPS	
Hole Number	CPT-03	Date and Time	9/21/2013 9:18:03 AM	Maximum Depth	24.61 ft
EST GW Depth During Test			30.00 ft		

Net Area Ratio .8



1 - sensitive fine grained	4 - silty clay to clay	7 - silty sand to sandy silt	10 - gravelly sand to sand
2 - organic material	5 - clayey silt to silty clay	8 - sand to silty sand	11 - very stiff fine grained (*)
3 - clay	6 - sandy silt to clayey silt	9 - sand	12 - sand to clayey sand (*)

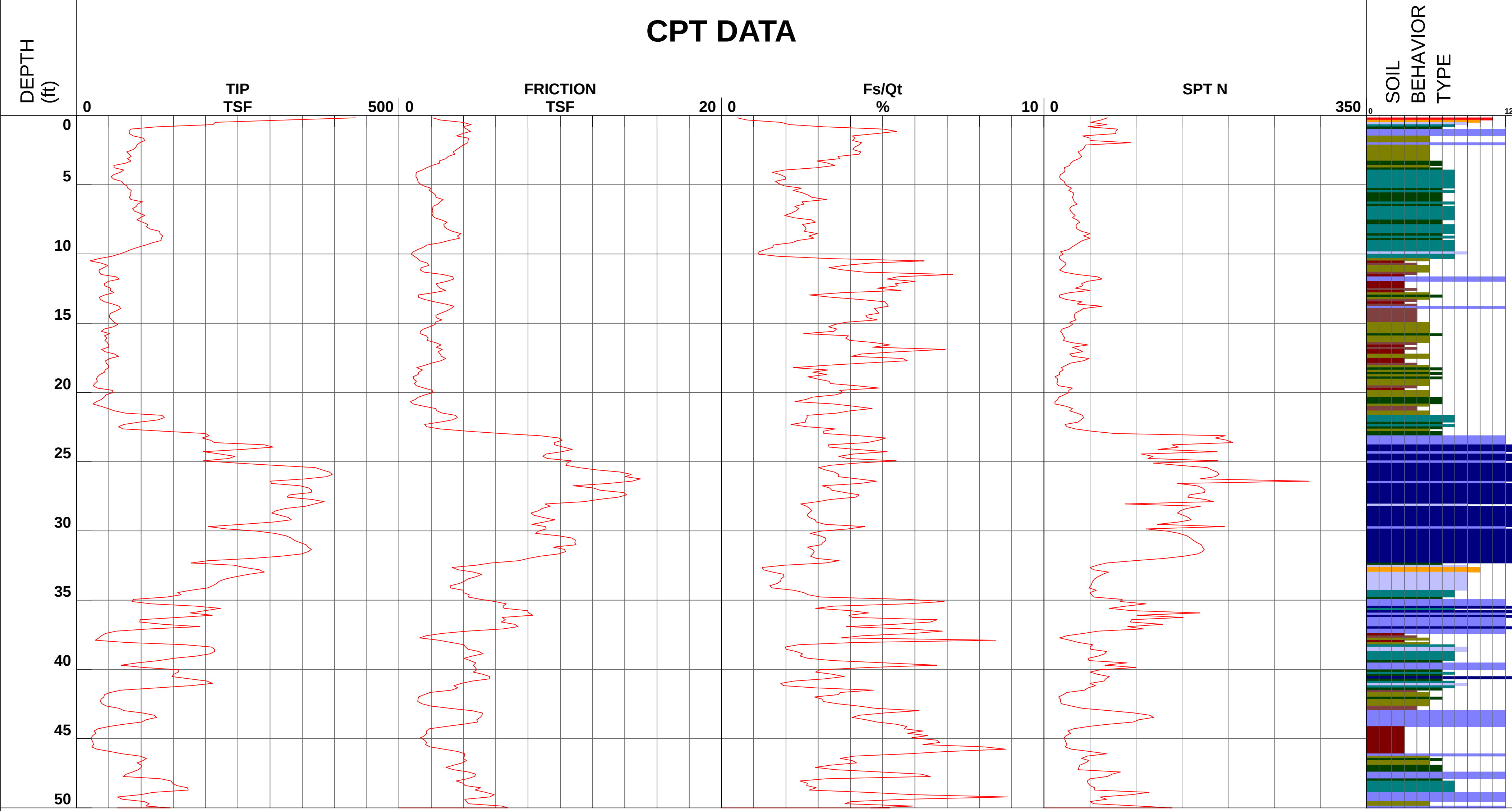
Cone Size 10cm squared

S*Soil behavior type and SPT based on data from UBC-1983

G-Force

Project	Cedar and Kettner Blvd Parking Structur	Operator	SA-BH	Filename	SDF(109).cpt
Job Number	GF13596	Cone Number	DSG1104	GPS	
Hole Number	CPT-04	Date and Time	9/21/2013 11:21:42 AM	Maximum Depth	50.52 ft
EST GW Depth During Test			28.00 ft		

Net Area Ratio .8



1 - sensitive fine grained	4 - silty clay to clay	7 - silty sand to sandy silt	10 - gravelly sand to sand
2 - organic material	5 - clayey silt to silty clay	8 - sand to silty sand	11 - very stiff fine grained (*)
3 - clay	6 - sandy silt to clayey silt	9 - sand	12 - sand to clayey sand (*)

Cone Size 10cm squared

S*Soil behavior type and SPT based on data from UBC-1983

G-Force

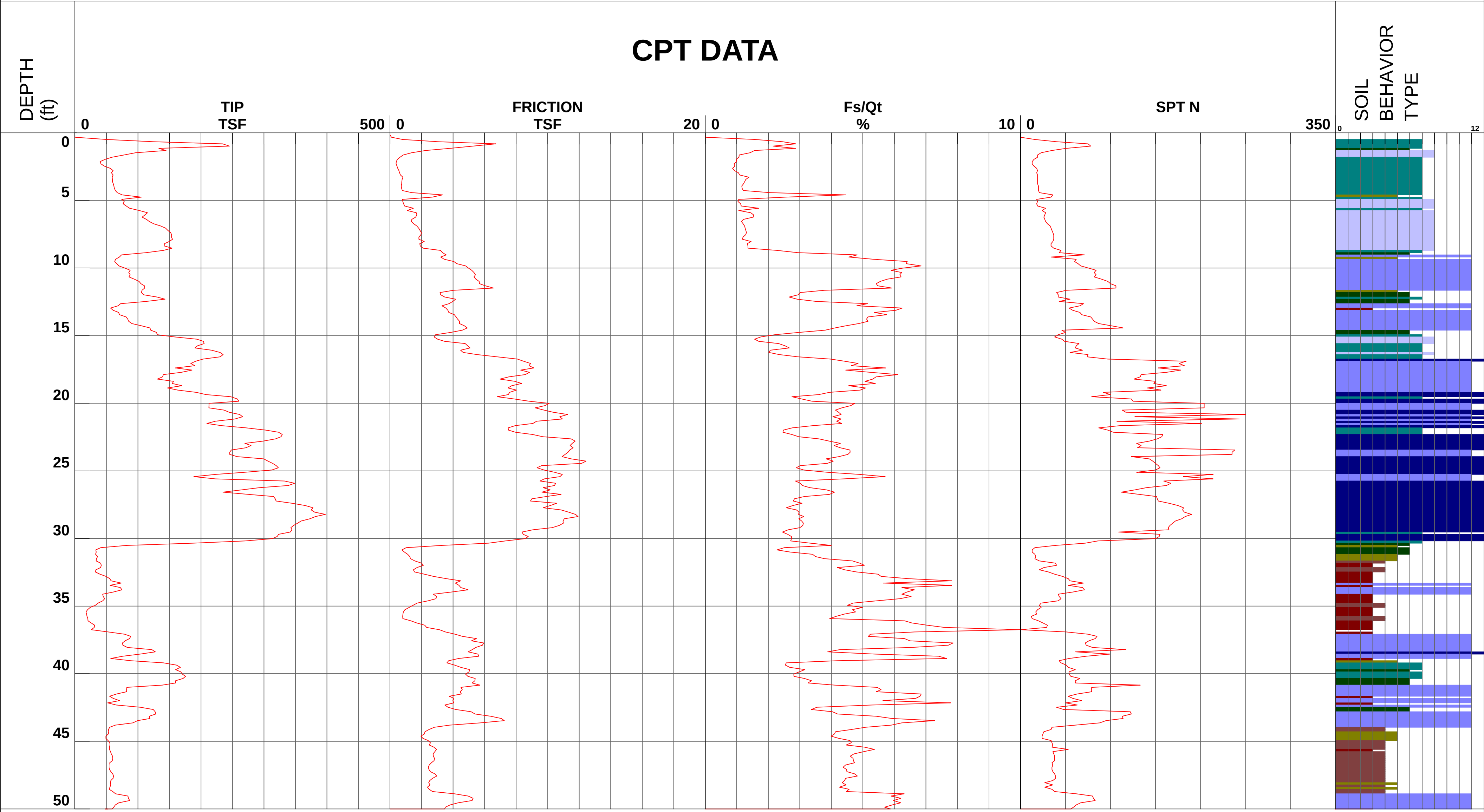
Middle Earth Geo Testing Inc.

Project	Cedar and Kettner Blvd Parking Structur	Operator	SA-BH
Job Number	GF13596	Cone Number	DSG1104
Hole Number	CPT-05	Date and Time	9/21/2013 10:25:00 AM
EST GW Depth During Test			28.00 ft

Filename	SDF(108).cpt
GPS	
Maximum Depth	50.52 ft

Net Area Ratio .8

CPT DATA



1 - sensitive fine grained	4 - silty clay to clay	7 - silty sand to sandy silt	10 - gravelly sand to sand
2 - organic material	5 - clayey silt to silty clay	8 - sand to silty sand	11 - very stiff fine grained (*)
3 - clay	6 - sandy silt to clayey silt	9 - sand	12 - sand to clayey sand (*)

Cone Size 10cm squared

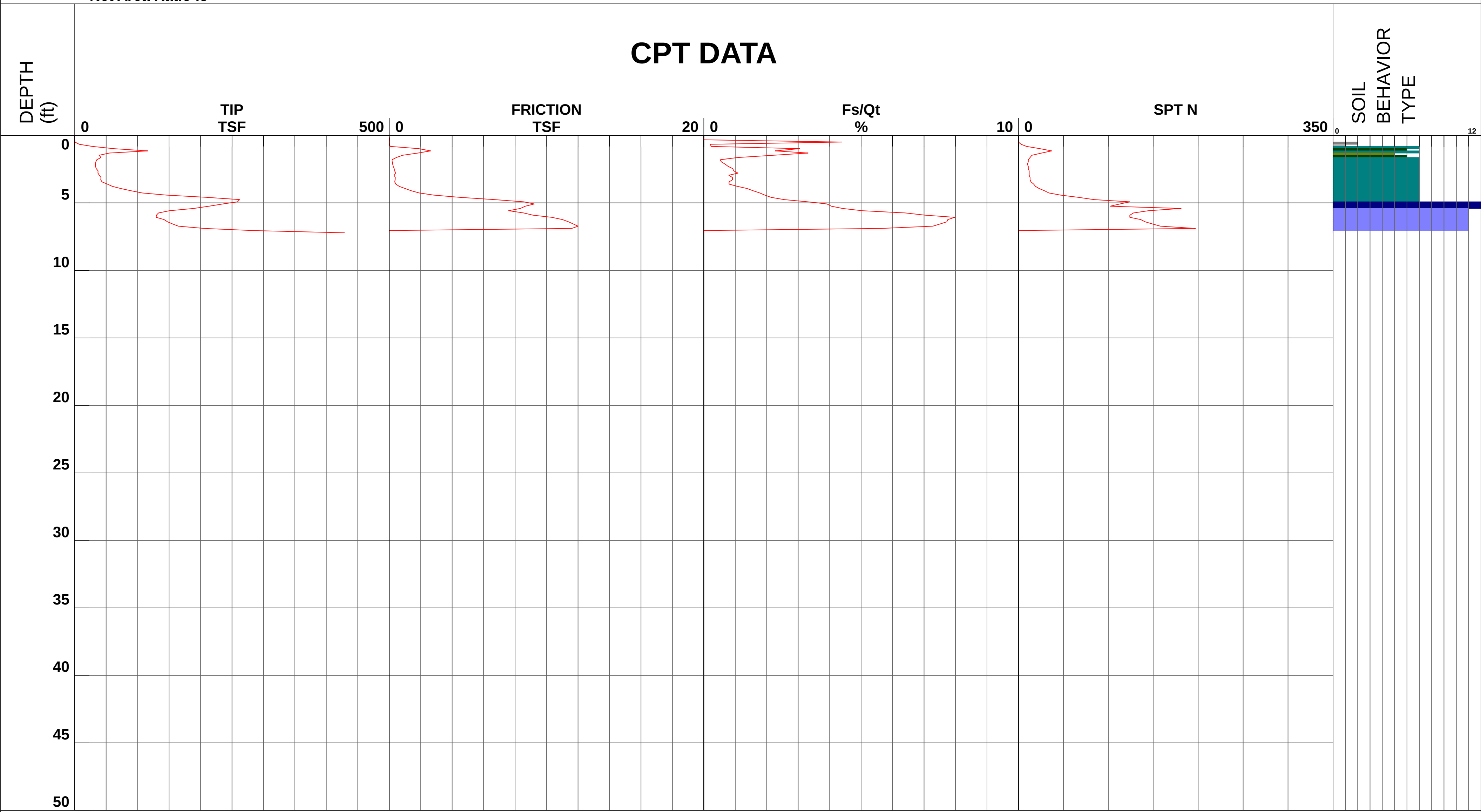
S*Soil behavior type and SPT based on data from UBC-1983

G-Force

Middle Earth Geo Testing Inc.

Project	Cedar and Kettner Blvd Parking Structur	Operator	SA-BH	Filename	SDF(110).cpt
Job Number	GF13596	Cone Number	DSG1104	GPS	
Hole Number	CPT-06	Date and Time	9/21/2013 12:48:36 PM	Maximum Depth	7.22 ft
EST GW Depth During Test		28.00 ft			

Net Area Ratio .8



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Cone Size 10cm squared

S*Soil behavior type and SPT based on data from UBC-1983

APPENDIX A-2

FIELD DATA

GEOCON

APPENDIX A

FIELD INVESTIGATION

Fieldwork for our investigations was performed between July 28 and August 1, 2003 and consisted of the excavation and detailed logging of two exploratory trenches and five small-diameter borings. The locations of the exploratory trenches and borings are shown on the Site Plan, Figure 2. Trench logs, boring logs, and an explanation of the geologic units encountered are presented on Figures A-1 through A-9.

The small-diameter borings were drilled to depths of between 71 and 91 feet below the existing ground surface using a truck-mounted drill rig equipped with mud rotary drilling equipment. Relatively undisturbed samples were obtained from the small-diameter borings by driving a 3-inch O.D. split-tube sampler 12 inches into the undisturbed soil mass with blows from a 140-pound hammer falling a distance of 30 inches. The sampler was equipped with 1-inch-high by 2⅜-inch-diameter brass sampler rings to facilitate removal and testing.

The trenches were oriented in a generally east-west direction at close to right angles to the regional and local trend of splays within the Rose Canyon Fault Zone. A total of 314 lineal feet of trench was logged by our engineering geologist during the investigation. The trenches were excavated to a maximum depth of 14.5 feet below the existing ground surface with a rubber-tired John Deere 310 backhoe.

Trench widths were generally 2 feet with locally wider areas where sloughing occurred. Detailed logging of the trench walls was performed at a scale of 1 inch equals 5 feet (1" = 5′). Stationing along the trench surfaces was established during logging for accurate location of features and for ease of description. Also, a horizontal string line was established within the trenches for use as an internal reference. The entire surface of the formations exposed along the respective north and south sides of each trench was cleaned and examined for indications of faulting. These indications could include offset units, contacts, laminations, tectonically disturbed or deformed clay layers, clay gouge, fissures, or slickensides.

The soils encountered in the borings and trenches were visually examined, classified and logged in general accordance with American Society for Testing and Materials (ASTM) practice for Description and Identification of Soils (Visual-Manual Procedure D2488). The logs depict the soil and geologic conditions observed and the depth at which samples were obtained.

Asphalt concrete was used to repair the parking lot's surface on August 1, 2003.

PROJECT NO. 06851-22-02

BORING B 1

ELEV. (MSL.) ____________ DATE COMPLETED 07-30-2003

EQUIPMENT MUD ROTARY

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**BAY POINT FORMATION** Medium dense, moist, red-brown, Silty, fine to coarse SAND and gravel			
2	B1-1			SM		21	123.5	8.7
4								
6	B1-2					24		
8								
10	B1-3					24		
12								
14								
16	B1-4				-Becomes dense at 15 feet	42		
18								
20	B1-5					60	104.3	19.8
22								
24				SC	**SAN DIEGO FORMATION** Very dense, moist, olive green, Clayey, fine to coarse SAND			
26	B1-6					43		
				CL	Hard, moist, olive green, Sandy CLAY			
28					-6" gravel at 27 feet			

Figure A-1,
Log of Boring B 1, Page 1 of 3

06851-22-02.GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06851-22-02

BORING B 1

ELEV. (MSL.) ____________ DATE COMPLETED 07-30-2003

EQUIPMENT MUD ROTARY

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B1-7			SC	Very dense, moist, olive-green, Clayey, fine to coarse SAND	42		
32								
34			▼					
35	B1-8					52		
36								
38								
40	B1-9			SC	Very stiff, saturated, mottled, tan and orange, Sandy SILT, micaceous	31	103.3	23.5
42								
44								
45	B1-10			ML	Very stiff, saturated, gray brown, Sandy CLAY	21		
46								
48								
50	B1-11			SC	Dense, saturated, green-brown, Clayey SAND -6" layer of gravel at 52 feet	26	116.6	15.7
52								
54								
55	B1-12			CL	Very stiff, saturated, gray, Sandy CLAY	18		
56								
58								

Figure A-1,
Log of Boring B 1, Page 2 of 3

06851-22-02.GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06851-22-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B 1 ELEV. (MSL.) ______ DATE COMPLETED 07-30-2003 EQUIPMENT **MUD ROTARY**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
60	B1-13			SM	Very dense, saturated, gray-brown, Silty, fine to coarse SAND	81/11"	107.3	21.1
62				GC	Very dense, saturated, gray-brown, Sandy GRAVEL			
64	B1-14			CL	Hard, saturated, gray brown, Sandy CLAY	34		
66 – 70	B1-15			SC	Dense, saturated, orange-brown, Clayey, fine to coarse SAND	22	111.8	17.3

BORING TERMINATED AT 71 FEET
Groundwater at 34 feet
Hole filled with 1 x 50lb sack of cement grout

Figure A-1,
Log of Boring B 1, Page 3 of 3

06851-22-02.GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

PROJECT NO. 06851-22-02

BORING B 2

ELEV. (MSL.) ____________ DATE COMPLETED 07-30-2003

EQUIPMENT MUD ROTARY

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**UNDOCUMENTED FILL** Dense, moist, green-gray, Silty, fine to medium SAND			
2	B2-1			SM		13		
4								
6	B2-2					25		
8								
10	B2-3					18	126.2	10.0
12					**BAY POINT FORMATION** Medium dense, moist, mottled orange-brown, Silty, fine to coarse SAND			
14								
16	B2-4			SM		9		
18								
20	B2-5				-Becomes green-gray at 20 feet	75		
22								
24								
26	B2-6					66		
28								

Figure A-2,
Log of Boring B 2, Page 1 of 3

06851-22-02.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06851-22-02

BORING B 2

ELEV. (MSL.) ______ DATE COMPLETED **07-30-2003**

EQUIPMENT **MUD ROTARY**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B2-7				-No recovery	60		
32			▼	SM				
34								
35	B2-8				-6" gravel layer at 35 feet	15		
36					**SAN DIEGO FORMATION** Stiff, saturated, mottled orange-tan, Sandy SILT, micaceous			
38				ML				
39					-10" gravel layer at 39 feet			
40	B2-9				-No recovery	37		
42				CL	Stiff, saturated, mottled orange and gray brown, Sandy CLAY			
44								
45	B2-10					36		
46				ML	Very stiff, saturated, mottled orange and gray brown, Sandy SILT			
48								
50	B2-11					34	101.9	24.1
52								
54				CL	Hard, saturated, mottled orange and tan, CLAY			
55	B2-12					32		
56								
58								

Figure A-2,
Log of Boring B 2, Page 2 of 3

06851-22-02.GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B 2 ELEV. (MSL.) ____ DATE COMPLETED 07-30-2003 EQUIPMENT MUD ROTARY	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
60	B2-13					71		
62				CL				
64					-4" Layer of gravel at 64 feet			
	B2-14					50/2"		
66					-6" layer of gravel at 65.5 feet			
				SM	Very dense, saturated, mottled orange and gray, Silty, fine to coarse SAND			
68								
70	B2-15					73	114.5	16.3
					BORING TERMINATED AT 71 FEET Groundwater at 31.8 feet Hole filled with 1 x 50lb sack of cement slurry			

Figure A-2,
Log of Boring B 2, Page 3 of 3

06851-22-02.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

PROJECT NO. 06851-22-02

BORING B 3

ELEV. (MSL.) ________ DATE COMPLETED **07-31-2003**

EQUIPMENT **MUD ROTARY**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**FILL** Medium dense, moist, red-brown, Silty, fine to medium SAND			
2	B3-1					6	116.1	8.0
4					**BAY POINT FORMATION** Medium dense, moist, red-brown, Silty, fine to medium SAND			
6	B3-2					25		
8								
10	B3-3			SM		36		
12								
14								
16	B3-4				-Becomes mottled, orange-tan at 15 feet	20		
18					-12" thick gravel layer at 18 feet			
20	B3-5				-Becomes silty fine sand	70	109.4	13.9
22								
24								
26	B3-6				-No recovery	59		
28								

Figure A-3,
Log of Boring B 3, Page 1 of 3

06851-22-02.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06851-22-02

BORING B 3

ELEV. (MSL.) ______ DATE COMPLETED **07-31-2003**

EQUIPMENT **MUD ROTARY**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B3-7				Very dense, moist, tan, Clayey, fine SAND	20		
32			▼	SC				
34					**SAN DIEGO FORMATION** Hard, saturated, tan-gray, Sandy SILT, micaceous			
36	B3-8					36		
38				ML				
40	B3-9					34	106.8	21.7
42								
44								
46	B3-10				Very stiff, saturated, mottled orange and gray, Sandy CLAY	20		
48								
50	B3-11			CL		39	104.1	11.5
52								
54								
56	B3-12					50/3-1/2"		
58					-6" gravel layer at 59 feet			

Figure A-3,
Log of Boring B 3, Page 2 of 3

06851-22-02.GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06851-22-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING B 3** ELEV. (MSL.) ______ DATE COMPLETED **07-31-2003** EQUIPMENT **MUD ROTARY**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
60	B3-13				Dense, saturated, mottled, olive green and orange, Clayey, fine to medium SAND	53	112.7	17.3
62				SC				
64					-6" Layer of gravel at 63 feet			
66	B3-14				-Becomes silty fine sand at 65 feet	81		
68								
70	B3-15					70		
					BORING TERMINATED AT 71 FEET Groundwater at 32.5 feet Hole filled with 1 x 50lb sack of cement slurry			

Figure A-3,
Log of Boring B 3, Page 3 of 3

06851-22-02.GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06851-22-02

BORING B 4

ELEV. (MSL.) ______ DATE COMPLETED 07-31-2003

EQUIPMENT MUD ROTARY

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**BAY POINT FORMATION** Medium dense, moist, red-brown, Silty, fine to medium SAND			
2	B4-1			SM		9		
4								
6	B4-2				-Becomes dense at 5 feet	32		
8								
10	B4-3					30	119.7	11.9
12								
14								
16	B4-4					36		
18								
20	B4-5				-Becomes micaceous at 20 feet	48		
22								
24								
26	B4-6					53		
28			▼					

Figure A-4,
Log of Boring B 4, Page 1 of 3

06851-22-02.GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▩ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06851-22-02

BORING B 4

ELEV. (MSL.) ________ DATE COMPLETED 07-31-2003

EQUIPMENT MUD ROTARY

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B4-7				**SAN DIEGO FORMATION** Dense, moist, mottled orange and olive green, Clayey, fine to medium SAND	18	105.3	21.8
32								
34								
	B4-8			SC		43		
36								
38								
40	B4-9				Very stiff, saturated, olive-green, SILT, micaceous	32		
42								
				ML				
44								
	B4-10					28		
46								
					Very stiff, saturated, olive-gray, CLAY			
48								
50	B4-11			CL		34	109.3	19.9
52								
54								
	B4-12				Dense, saturated, green-tan, fine to coarse SAND, trace clay	41		
56								
				SP				
58								

Figure A-4,
Log of Boring B 4, Page 2 of 3

06851-22-02.GPJ

SAMPLE SYMBOLS		
... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06851-22-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B 4 ELEV. (MSL.) ________ DATE COMPLETED 07-31-2003 EQUIPMENT **MUD ROTARY**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
60	B4-13			CL	Very stiff, saturated, olive-green, CLAY	27		
62								
64								
	B4-14			SC	Very dense, saturated, tan, Clayey, fine to coarse SAND	50/5"		
66								
68								
70	B4-15						108.6	19.2
					BORING TERMINATED AT 71 FEET Groundwater at 27.5 feet Hole filled with 1 x 50lb sack of cement slurry			

Figure A-4,
Log of Boring B 4, Page 3 of 3

06851-22-02.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06851-22-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B 5 ELEV. (MSL.) ____ DATE COMPLETED 07-30-2003 EQUIPMENT MUD ROTARY	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0					**BAY POINT FORMATION** Very dense, moist, red-brown, Silty, fine to medium SAND			
2				SM				
4								
6								
8								
10	B5-1					69/11"		
12								
14								
16								
18								
20	B5-2					75		
22								
24								
26								
28								

Figure A-5,
Log of Boring B 5, Page 1 of 4

06851-22-02.GPJ

SAMPLE SYMBOLS	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06851-22-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B 5 ELEV. (MSL.) ______ DATE COMPLETED 07-30-2003 EQUIPMENT **MUD ROTARY**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
30	B5-3					67		
32			▼	SM	-Becomes saturated at 31.3 feet			
34								
36					**SAN DIEGO FORMATION** Very stiff, saturated, mottled green-gray and orange, Sandy SILT			
38								
40	B5-4			ML		25		
42								
44								
46								
48								
50	B5-5					31	98.4	26.7
52								
54								
56								
58								

Figure A-5,
Log of Boring B 5, Page 2 of 4

06851-22-02.GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 06851-22-02

BORING B 5

ELEV. (MSL.) ____________ DATE COMPLETED 07-30-2003

EQUIPMENT MUD ROTARY

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60	B5-6			SM	Very dense, saturated, brown, Silty, fine to coarse SAND	77		
62					-6" Layer of gravel at 61.5 feet			
64								
66								
68								
70	B5-7					40	111.0	18.8
72								
74								
76								
78								
80	B5-8					80	120	13.1
82								
84								
86								
88								

Figure A-5,
Log of Boring B 5, Page 3 of 4

06851-22-02.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 06851-22-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B 5 ELEV. (MSL.) ______ DATE COMPLETED 07-30-2003 EQUIPMENT MUD ROTARY	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
90	B5-9					55	108.7	20.6
					BORING TERMINATED AT 91 FEET Groundwater at 31.3 feet Hole filed with 2 x 50lb sacks of cement slurry			

Figure A-5,
Log of Boring B 5, Page 4 of 4

06851-22-02.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

APPENDIX B

LABORATORY TEST RESULTS

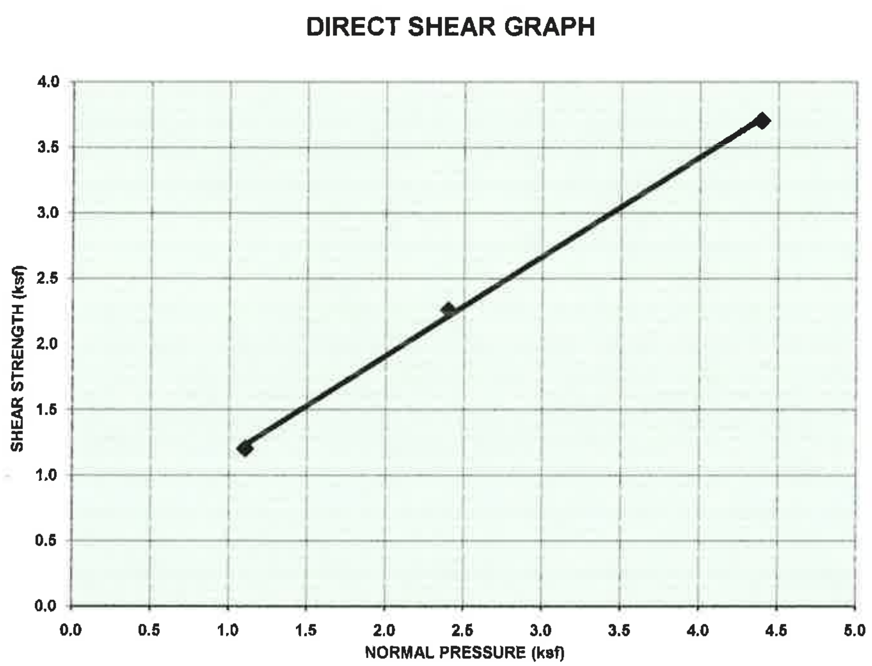
APPENDIX B-1

LABORATORY DATA

G-Force

DIRECT SHEAR TEST REPORT

G-FORCE LAB NO.:	9591
SAMPLE LOCATION:	HS-1 @25'
SOIL TYPE:	Gray to Lt. Brown Silty Sand (SW/SM)
SAMPLE TYPE:	Undisturbed Ring Sample



CALCULATED DATA

INITIAL					
	WET DENSITY	pcf	135.3	137.1	138.1
	DRY DENSITY	pcf	119.2	121.8	122.8
	MOISTURE	%	13.5	12.5	12.4
FINAL, at failure					
	MOISTURE	%	18.8	17.5	15.8

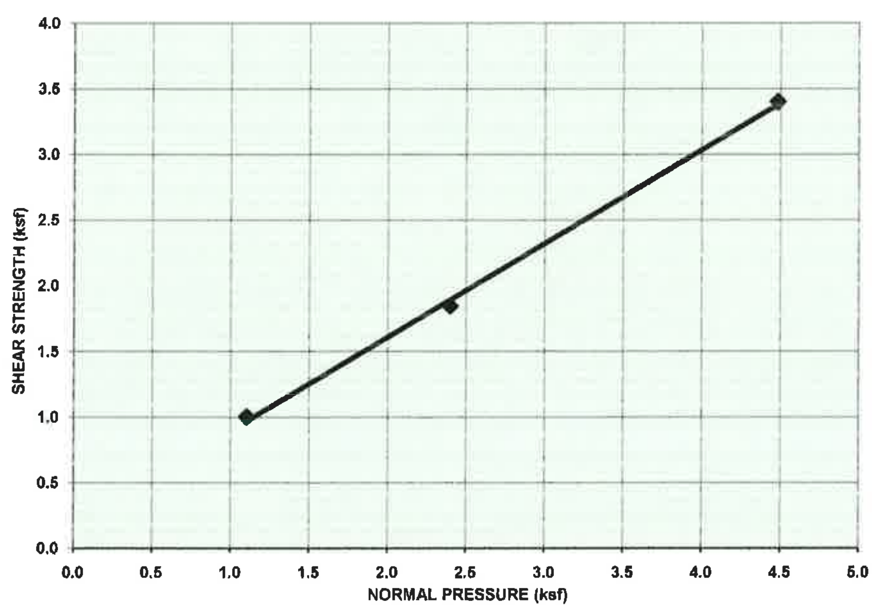
NORMAL PRESSURE, ksf	1.10	2.40	4.39
SHEAR STRENGTH, ksf	1.21	2.26	3.71
FRICTION ANGLE, degrees	37.0		
COHESION, ksf	0.40		

Reviewed by: Joseph Bouknight, P.E., C81517

DVBE SDVOSB SBE

DIRECT SHEAR TEST REPORT

G-FORCE LAB NO.:	9594
SAMPLE LOCATION:	HS-1 @40'
SOIL TYPE:	Gray Sand (SW)
SAMPLE TYPE:	Undisturbed Ring Sample



CALCULATED DATA

INITIAL					
	WET DENSITY	pcf	127.4	128.9	125.8
	DRY DENSITY	pcf	109.3	111.1	107.3
	MOISTURE	%	16.5	16.1	17.3
FINAL, at failure					
	MOISTURE	%	24.8	22.0	23.2

NORMAL PRESSURE, ksf	1.10	2.40	4.48
SHEAR STRENGTH, ksf	1.00	1.84	3.40
FRICTION ANGLE, degrees	35.7		
COHESION, ksf	0.18		

Reviewed by: Joseph Bouknight, P.E., C81517

FORCE
DVBE SDVOSB SBE

Soil Corrosivity

(ASTM D4972,G187-12a,CTM 417,CTM 422)

Lab Number	Boring No.	Depth	Sulfate %	Chloride %	PH	Resistivity (OHM-cm)
9596	HS-2	20'	0.009	0.022	7.65	2025

Date Sampled: 9/21/2013
Sampled By: JEN
Date Submitted: 9/24/2013
Submitted By: PJD

Reviewed by: Joe Bouknight
Joseph Bouknight, P.E., C81517

L A B O R A T O R Y   R E P O R T

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Date: October 2, 2013
Purchase Order Number: 2956
Sales Order Number: 19615
Account Number: GFO
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G Force
4035 Pacific Highway
San Diego, CA 92110
Attention: Adam Thomas

Laboratory Number: SO5103   Customers Phone: 583-6633
Fax: 583-6654

Sample Designation:

One soil sample received on 09/30/13 at 9:00am,
taken from Cedar/Kettner Parking Structure Proj# GF13596
marked as follows:

ANALYSIS: Water Soluble Sulfate (SO_4) California Test 417
Water Soluble Chloride (Cl) California Test 422

Sample	SO_4%	Cl%
#1 Lab#9596 HS-2 @ 20'	0.009	0.022

Laura Torres
LT/ram

Soil Density and Moisture Content

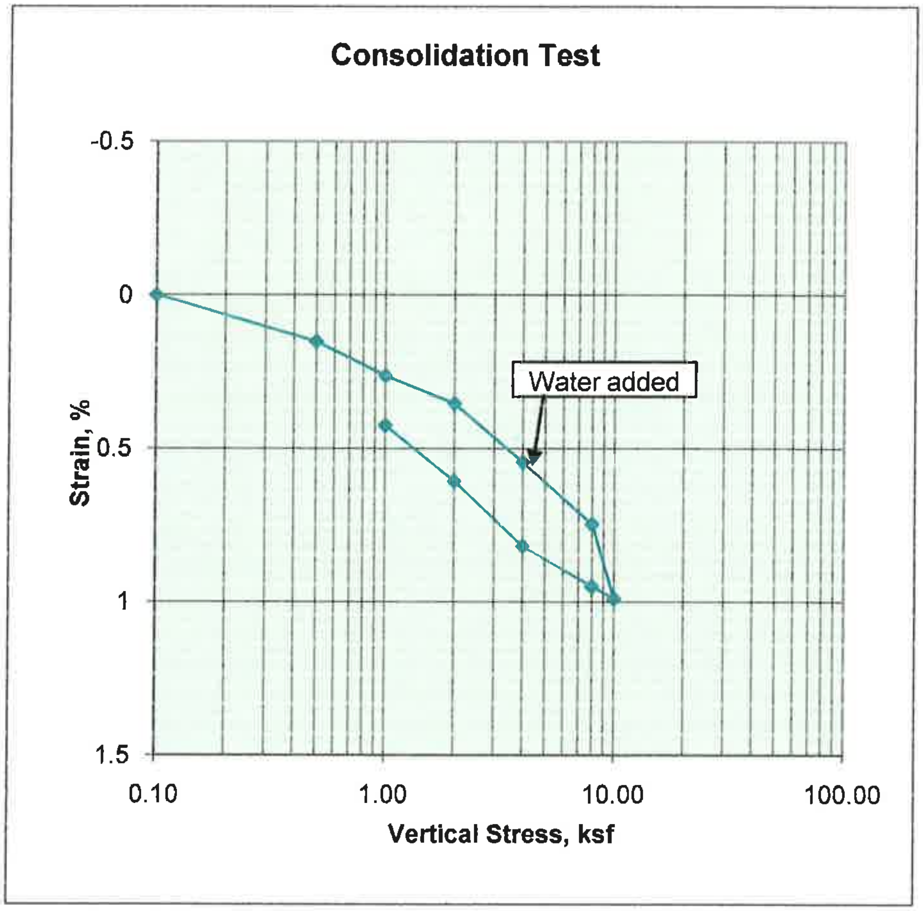
Lab No.	9590	9595	9600
Boring No.	HS-1	HS-1	HS-2
Depth, ft.	20'	45'	40'
Moisture Content, %	13.4	28.3	22.4
Dry Density, pcf	110.3	97.5	106.1

Reviewed by: Joseph Bouknight, P.E., C81517

Consolidation Properties of Soils

ASTM D2435

Sample Location: HS-1 @ 35'
Date Sampled: September 21, 2013
Sample Description: Tan Sand (SP/SM)
G Force Lab No. 9593



Consolidation Data

Stress, ksf	Strain, %	Void Ratio
0.10	0	0.365
0.50	0.15	0.362
1.00	0.26	0.361
2.00	0.35	0.360
4.00	0.55	0.357
4.00	0.55	0.357
8.00	0.75	0.354
10.00	0.99	0.351
8.00	0.95	0.352
4.00	0.82	0.353
2.00	0.61	0.356
1.00	0.42	0.359

Moisture and Density Data

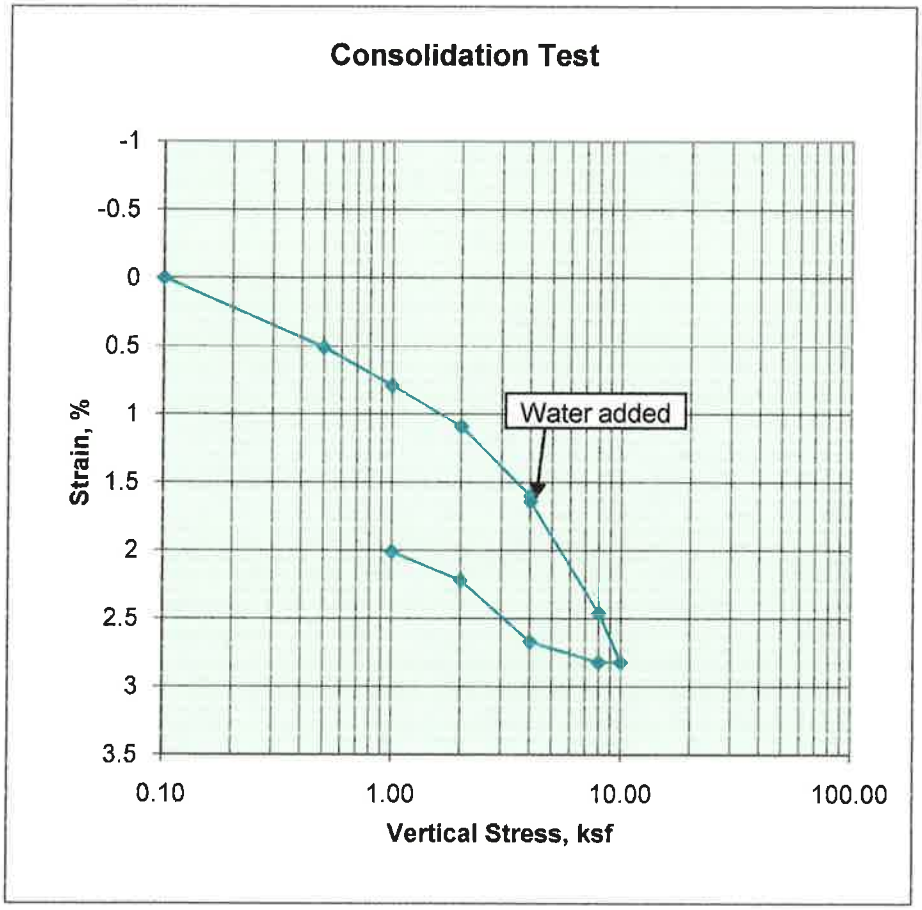
	Initial	Final
Moisture Content, %	14.4	14.8
Dry Density, pcf	122.2	122.3

Reviewed by: Joseph Bouknight, P.E., C81517

Consolidation Properties of Soils

ASTM D2435

Sample Location: HS-2 @ 35'
Date Sampled: September 21, 2013
Sample Description: Tan Fine Silty Sand (SM)
G Force Lab No. 9599



Consolidation Data

Stress, ksf	Strain, %	Void Ratio
0.10	0	0.422
0.50	0.51	0.415
1.00	0.79	0.411
2.00	1.09	0.407
4.00	1.60	0.400
4.00	1.64	0.399
8.00	2.46	0.387
10.00	2.82	0.382
8.00	2.82	0.382
4.00	2.67	0.384
2.00	2.22	0.391
1.00	2.01	0.394

Moisture and Density Data

	Initial	Final
Moisture Content, %	16.7	16.7
Dry Density, pcf	117.6	118.1

Reviewed by: Joe Bouknight
Joseph Bouknight, P.E., C81517

APPENDIX B-2

LABORATORY DATA

GEOCON 2003

APPENDIX B

LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected soil samples were tested for their in-place dry density and moisture content, consolidation, shear strength, expansion, compaction, "R" Value, water-soluble sulfate, pH, and resistivity characteristics.

The results of our laboratory tests are presented on Tables B-I through B-VI and on Figure B-1. The in-place dry density and moisture content results are indicated on the exploratory boring logs.

TABLE B-I
SUMMARY OF LABORATORY DIRECT SHEAR TEST RESULTS
ASTM D3080-98

Sample No.	Dry Density (pcf)	Moisture Content (%)	Unit Cohesion (psf)	Angle of Shear Resistance (degrees)
B3-5	109.4	13.9	640	41
B3-9	106.8	21.7	669	34
B5-5	98.4	26.7	1213	27

TABLE B-II
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D4829-95

Sample No.	Moisture Content		Dry Density (pcf)	Expansion Index
	Before Test (%)	After Test (%)		
B3-11	11.5	33.3	104.1	115
T2-1	9.3	18.6	115.8	4

TABLE B-III
SUMMARY OF LABORATORY pH AND RESISTIVITY TEST RESULTS
CALIFORNIA TEST NO. 643

Sample No.	pH	Minimum Resistivity (ohm-centimeters)
B2-4	7.9	630

TABLE B-IV
SUMMARY OF LABORATORY WATER-SOLUBLE SULFATE TEST RESULTS
CALIFORNIA TEST NO. 417

Sample No.	Water-Soluble Sulfate (%)
B2-4	0.036

TABLE B-V
SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS
ASTM D 1557-00

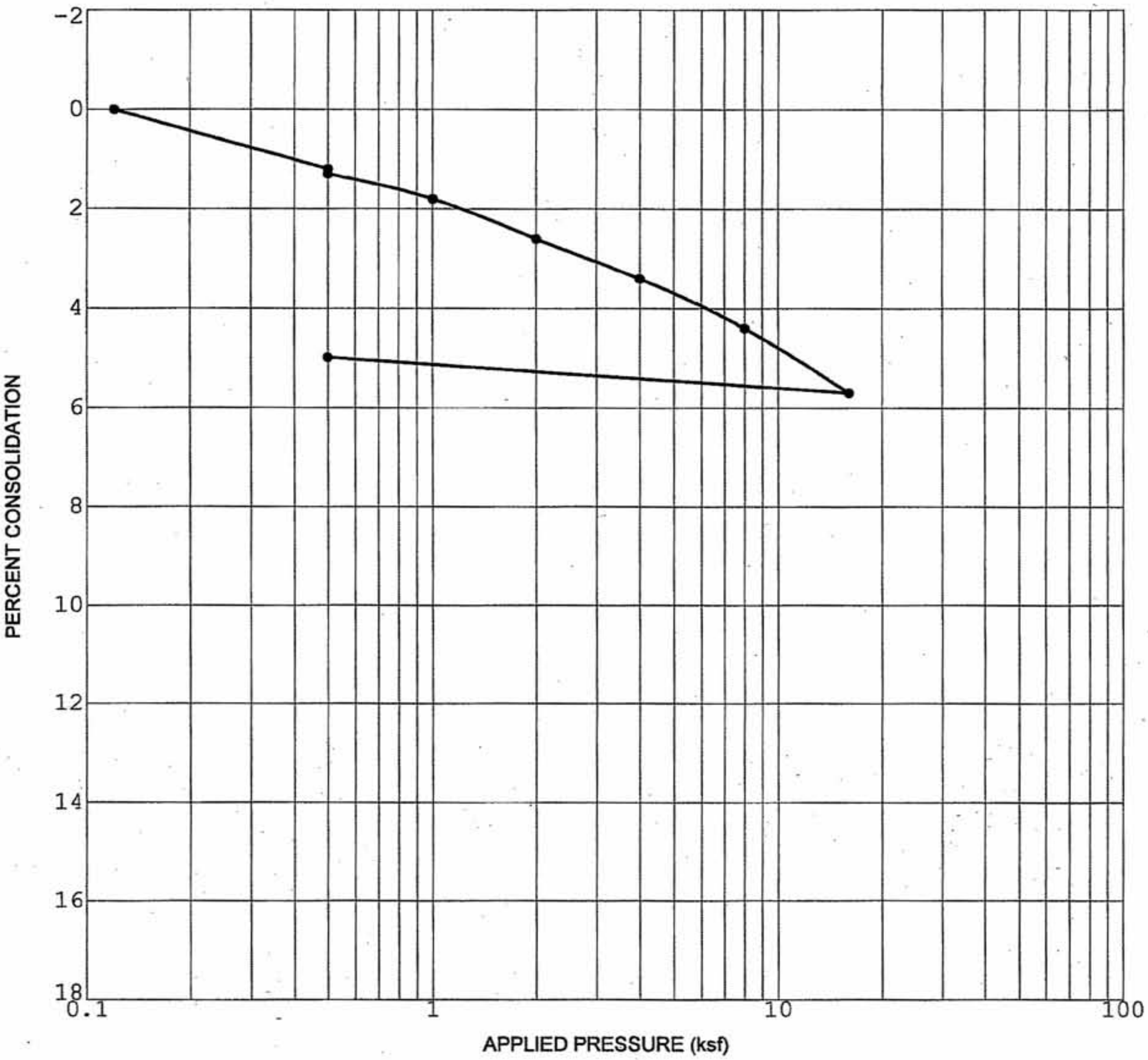
Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
T2-1	Moderate brown, Silty SAND	133.0	8.2

TABLE B-VI
SUMMARY OF LABORATORY R-VALUE TEST RESULTS
ASTM D 2844-94

Sample No.	R-Value
T2-1	47

PROJECT NO. 06851-22-02

SAMPLE NO. B1-13



Initial Dry Density (kg/m3)	107.3		Initial Saturation (%)	100+
Initial Water Content (%)	21.1		Sample Saturated at (ksf)	0.5

CONSOLIDATION CURVE

CEDAD/KETTNER PARKING/RESIDENTIAL STRUCTURE

SAN DIEGO, CALIFORNIA

06851-22-02.GPJ

Figure B-1

APPENDIX C

GENERAL EARTHWORK SPECIFICATIONS

AND GRADING GUIDELINES

GENERAL EARTHWORK SPECIFICATIONS

I. General

A. General procedures and requirements for earthwork and grading are presented herein. The earthwork and grading recommendations provided in the geotechnical report are considered part of these specifications, and where the general specifications provided herein conflict with those provided in the geotechnical report, the recommendations in the geotechnical report shall govern. Recommendations provided herein and in the geotechnical report may need to be modified depending on the conditions encountered during grading.

B. The contractor is responsible for the satisfactory completion of all earthwork in accordance with the project plans, specifications, applicable building codes, and local governing agency requirements. Where these requirements conflict, the stricter requirements shall govern.

C. It is the contractor's responsibility to read and understand the guidelines presented herein and in the geotechnical report as well as the project plans and specifications. Information presented in the geotechnical report is subject to verification during grading. The information presented on the exploration logs depicts conditions at the particular time of excavation and at the location of the excavation. Subsurface conditions present at other locations may differ, and the passage of time may result in different subsurface conditions being encountered at the locations of the exploratory excavations. The contractor shall perform an independent investigation and evaluate the nature of the surface and subsurface conditions to be encountered and the procedures and equipment to be used in performing his work.

D. The contractor shall have the responsibility to provide adequate equipment and procedures to accomplish the earthwork in accordance with applicable requirements. When the quality of work is less than that required, the Geotechnical Consultant may reject the work and may recommend that the operations be suspended until the conditions are corrected.

E. Prior to the start of grading, a qualified Geotechnical Consultant should be employed to observe grading procedures and provide testing of the fills for conformance with the project specifications, approved grading plan, and guidelines presented herein. All remedial removals, clean-outs, removal bottoms, keyways, and subdrain installations should be observed and documented by the Geotechnical Consultant prior to placing fill. It is the contractor's responsibility to apprise the Geotechnical Consultant of their schedules and notify the Geotechnical Consultant when those areas are ready for observation.

F. The contractor is responsible for providing a safe environment for the Geotechnical Consultant to observe grading and conduct tests.

II. Site Preparation

A. Clearing and Grubbing: Excessive vegetation and other deleterious material shall be sufficiently removed as required by the Geotechnical Consultant, and such materials shall be properly disposed of offsite in a method acceptable to the owner and governing agencies. Where applicable, the contractor may obtain permission from the Geotechnical Consultant, owner, and governing agencies to dispose of vegetation and other deleterious materials in designated areas onsite.

B. Unsuitable Soils Removals: Earth materials that are deemed unsuitable for the support of fill shall be removed as necessary to the satisfaction of the Geotechnical Consultant.

C. Any underground structures such as cesspools, cisterns, mining shafts, tunnels, septic tanks, wells, pipelines, other utilities, or other structures located within the limits of grading shall be removed and/or abandoned in accordance with the requirements of the governing agency and to the satisfaction of the Geotechnical Consultant.

D. Preparation of Areas to Receive Fill: After removals are completed, the exposed surfaces shall be scarified to a depth of approximately 8 inches, watered or dried, as needed, to achieve a generally uniform moisture content that is at or near optimum moisture content. The scarified materials shall then be compacted to the project requirements and tested as specified.

E. All areas receiving fill shall be observed and approved by the Geotechnical Consultant prior to the placement of fill. A licensed surveyor shall provide survey control for determining elevations of processed areas and keyways.

III. Placement of Fill

A. Suitability of fill materials: Any materials, derived onsite or imported, may be utilized as fill provided that the materials have been determined to be suitable by the Geotechnical Consultant. Such materials shall be essentially free of organic matter and other deleterious materials, and be of a gradation, expansion potential, and/or strength that is acceptable to the Geotechnical Consultant. Fill materials shall be tested in a laboratory approved by the Geotechnical Consultant, and import materials shall be tested and approved prior to being imported.

B. Generally, different fill materials shall be thoroughly mixed to provide a relatively uniform blend of materials and prevent abrupt changes in material type. Fill materials derived from benching should be dispersed throughout the fill area instead of placing the materials within only an equipment-width from the cut/fill contact.

C. Oversize Materials: Rocks greater than 8 inches in largest dimension shall be disposed of offsite or be placed in accordance with the recommendations by the Geotechnical Consultant in the areas that are designated as suitable for oversize rock placement. Rocks that are smaller than 8 inches in largest dimension may be utilized in the fill provided that they are not nested and are their quantity and distribution are acceptable to the Geotechnical Consultant.

D. The fill materials shall be placed in thin, horizontal layers such that, when compacted, shall not exceed 6 inches. Each layer shall be spread evenly and shall be thoroughly mixed to obtain a near uniform moisture content and uniform blend of materials.

E. Moisture Content: Fill materials shall be placed at or above the optimum moisture content or as recommended by the geotechnical report. Where the moisture content of the engineered fill is less than recommended, water shall be added, and the fill materials shall be blended so that a near uniform moisture content is achieved. If the moisture content is above the limits specified by the Geotechnical Consultant, the fill materials shall be aerated by discing, blading, or other methods until the moisture content is acceptable.

F. Each layer of fill shall be compacted to the project standards in accordance to the project specifications and recommendations of the Geotechnical Consultant. Unless otherwise specified by the Geotechnical Consultant, the fill shall be compacted to a minimum of 90 percent of the maximum dry density as determined by ASTM Test Method: D1557-09.

G. Benching: Where placing fill on a slope exceeding a ratio of 5 to 1 (horizontal to vertical), the ground should be keyed or benched. The keyways and benches shall extend through all unsuitable materials into suitable materials such as firm materials or sound bedrock or as recommended by the Geotechnical Consultant. The minimum keyway width shall be 15 feet and extend into suitable materials, or as recommended by the geotechnical report and approved by the Geotechnical Consultant. The minimum keyway width for fill over cut slopes is also 15 feet, or as recommended by the geotechnical report and approved by the Geotechnical Consultant. As a general rule, unless otherwise recommended by the Geotechnical Consultant, the minimum width of the keyway shall be equal to 1/2 the height of the fill slope.

H. Slope Face: The specified minimum relative compaction shall be maintained out to the finish face of fill and stabilization fill slopes. Generally, this may be achieved by overbuilding the slope and cutting back to the compacted core. The actual amount of overbuilding may vary as field conditions dictate. Alternately, this may be achieved by backrolling the slope face with suitable equipment or other methods that produce the designated result. Loose soil should not be allowed to build up on the slope face. If present, loose soils shall be trimmed to expose the compacted slope face.

I. Slope Ratio: Unless otherwise approved by the Geotechnical Consultant and governing agencies, permanent fill slopes shall be designed and constructed no steeper than 2 to 1 (horizontal to vertical).

J. Natural Ground and Cut Areas: Design grades that are in natural ground or in cuts should be evaluated by the Geotechnical Consultant to determine whether scarification and processing of the ground and/or overexcavation is needed.

K. Fill materials shall not be placed, spread, or compacted during unfavorable weather conditions. When grading is interrupted by rain, filing operations shall not resume until the Geotechnical Consultant approves the moisture and density of the previously placed compacted fill.

IV. Cut Slopes

A. The Geotechnical Consultant shall inspect all cut slopes, including fill over cut slopes, and shall be notified by the contractor when cut slopes are started.

B. If adverse or potentially adverse conditions are encountered during grading, the Geotechnical Consultant shall investigate, evaluate, and make recommendations to mitigate the adverse conditions.

C. Unless otherwise stated in the geotechnical report, cut slopes shall not be excavated higher or steeper than the requirements of the local governing agencies. Short-term stability of the cut slopes and other excavations is the contractor's responsibility.

V. Drainage

A. Backdrains and Subdrains: Backdrains and subdrains shall be provided in fill as recommended by the Geotechnical Consultant and shall be constructed in accordance with the governing agency and/or recommendations of the Geotechnical Consultant. The location of subdrains, especially outlets, shall be surveyed and recorded by the Civil Engineer.

B. Top-of-slope Drainage: Positive drainage shall be established away from the top of slope. Site drainage shall not be permitted to flow over the tops of slopes.

C. Drainage terraces shall be constructed in compliance with the governing agency requirements and/or in accordance with the recommendations of the Geotechnical Consultant.

D. Non-erodible interceptor swales shall be placed at the top of cut slopes that face the same direction as the prevailing drainage.

VI. Erosion Control

A. All finish cut and fill slopes shall be protected from erosion and/or planted in accordance with the project specifications and/or landscape architect's recommendations. Such measures to protect the slope face shall be undertaken as soon as practical after completion of grading.

B. During construction, the contractor shall maintain proper drainage and prevent the ponding of water. The contractor shall take remedial measures to prevent the erosion of graded areas until permanent drainage and erosion control measures have been installed.

VII. Trench Excavation and Backfill

A. Safety: The contractor shall follow all OSHA requirements for safety of trench excavations. Knowing and following these requirements is the contractor's responsibility. All trench excavations or open cuts in excess of 5 feet in depth shall be shored or laid back. Trench excavations and open cuts exposing adverse geologic conditions may require further evaluation by the Geotechnical Consultant. If a contractor fails to provide safe access for compaction testing, backfill not tested due to safety concerns may be subject to removal.

B. Bedding: Bedding materials shall be non-expansive and have a Sand Equivalent greater than 30. Where permitted by the Geotechnical Consultant, the bedding materials can be densified by jetting.

C. Backfill: Jetting of backfill materials is generally not acceptable. Where permitted by the Geotechnical Consultant, the bedding materials can be densified by jetting provided the backfill materials are granular, free-draining and have a Sand Equivalent greater than 30.

VIII. Geotechnical Observation and Testing During Grading

A. Compaction Testing: Fill shall be tested by the Geotechnical Consultant for evaluation of general compliance with the recommended compaction and moisture conditions. The tests shall be taken in the compacted soils beneath the surface if the surficial materials are disturbed. The contractor shall assist the Geotechnical Consultant by excavating suitable test pits for testing of compacted fill.

B. Where tests indicate that the density of a layer of fill is less than required, or the moisture content not within specifications, the Geotechnical Consultant shall notify the contractor of the unsatisfactory conditions of the fill. The portions of the fill that are not within specifications shall be reworked until the required density and/or moisture content has been attained. No additional fill shall be placed until the last lift of fill is tested and found to meet the project specifications and approved by the Geotechnical Consultant.

C. If, in the opinion of the Geotechnical Consultant, unsatisfactory conditions, such as adverse weather, excessive rock or deleterious materials being placed in the fill, insufficient equipment, excessive rate of fill placement, results in a quality of work that is unacceptable, the consultant shall notify the contractor, and the contractor shall rectify the conditions, and if necessary, stop work until conditions are satisfactory.

D. Frequency of Compaction Testing: The location and frequency of tests shall be at the Geotechnical Consultant's discretion. Generally, compaction tests shall be taken at intervals not exceeding two feet in fill height and 1,000 cubic yards of fill materials placed.

E. Compaction Test Locations: The Geotechnical Consultant shall document the approximate elevation and horizontal coordinates of the compaction test locations. The contractor shall coordinate with the surveyor to assure that sufficient grade stakes are established so that the Geotechnical Consultant can determine the test locations. Alternately, the test locations can be surveyed and the results provided to the Geotechnical Consultant.

F. Areas of fill that have not been observed or tested by the Geotechnical Consultant may have to be removed and recompacted at the contractor's expense. The depth and extent of removals will be determined by the Geotechnical Consultant.

G. Observation and testing by the Geotechnical Consultant shall be conducted during grading in order for the Geotechnical Consultant to state that, in his opinion, grading has been completed in accordance with the approved geotechnical report and project specifications.

H. Reporting of Test Results: After completion of grading operations, the Geotechnical Consultant shall submit reports documenting their observations during construction and test results. These reports may be subject to review by the local governing agencies.